IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Appellant	:	**Hendricks et al.**	Attorney Docket No.: **SEDN/5515**
Serial No.:		**09/158,549**	Group Art Unit: **2623**
Filed:		**SEPTEMBER 22, 1998**	Examiner: **R. Brown**
Confirmation #:		**4086**	

For: **ADVANCED SET TOP TERMINAL WITH ELECTRONIC MAIL BOX FOR CABLE TELEVISION DELIVERY SYSTEMS**

MAIL STOP APPEAL BRIEF-PATENTS
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SIR:

APPEAL BRIEF

Appellants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 2623 dated June 30, 2006 finally rejecting claims 1, 2, 4-6, 16-17, 19-21 and 43-45.

In the event that an extension of time is required for this appeal brief to be considered timely, and a petition therefor does not otherwise accompany this appeal brief, any necessary extension of time is hereby petitioned for.

The Commissioner is authorized to charge the Appeal Brief fee ($500) and any other fees due to make this filing timely and complete (including extension of time fees) to Deposit Account No. 20-0782/SEDN/5515.

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Real Party in Interest

The real party in interest is SEDNA PATENT SERVICES, LLC.

Related Appeals and Interferences

Appellant asserts that no appeals or interferences are known to Appellant, Appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1, 2, 4-6, 16-17, 19-21 and 43-45 are pending in the application. Claims 1-40 were originally presented in the application. Claims 41-45 were added by amendment. Claims 3, 7-15, 18, and 22-42 have been canceled without prejudice. Claims 1, 2, 4-6, 16-17, 19-21 and 43-45 stand finally rejected as discussed below. The final rejection of claims 1, 2, 4-6, 16-17, 19-21 and 43-45 is appealed.

Status of Amendments

All claim amendments have been entered.

Summary of Claimed Subject Matter

Embodiments of the present invention generally are directed to a hardware upgrade for enhancing the functionality of a set top terminal in a television program delivery system and a method for use with a set top terminal in a television program delivery system. The hardware upgrade and method allow a set top terminal in a television program delivery system to have electronic mail processing capabilities.

For the convenience of the Board of Patent Appeals and Interferences, Appellant's independent claims 1, 16 and 45 are presented below in claim format with elements read on the various figures of the drawings and appropriate citations to at least one portion of the specification for each element of the appealed claims.

Claim 1 positively recites (with reference numerals, where applicable and cites to at least one portion of the specification added):

1. A hardware upgrade for enhancing the functionality of a set top terminal in a television program delivery system, each set top terminal adapted to receive electronic mail and having a microprocessor, the hardware upgrade comprising:

an interface (662, 720) for providing an electrical connection to the set top terminal (220), whereby digital data, including the electronic mail, is transferred from the set top terminal (220) for processing and the processed electronic mail is passed to the set top terminal (220) for display; (p. 25, l. 19 – p. 26, l. 7; p. 57, ll. 1-7) and

at least one microprocessor (602) connected to said interface (662, 720) for processing the electronic mail to produce processed electronic mail, the microprocessor (p. 57, ll. 6-7) of the hardware upgrade (p. 25, l. 19 – p. 26, l. 7) capable of communicating with the microprocessor (602) of the set top converter through the interface (662, 720).

Claim 16 positively recites (with reference numerals, where applicable and cites to at least one portion of the specification added):

16. A method for use with a set top terminal in a television program delivery system, each set top terminal adapted to receive electronic mail and having a microprocessor, the method comprising the steps of:

providing an electrical connection between the set top terminal (220) and a hardware upgrade (p. 25, l. 19 – p. 26, l. 7), whereby digital data, including the electronic mail, is transferred from the set top terminal (220) for processing; (p. 25, l. 19 – p. 26, l. 7; p. 57, ll. 1-7)

processing the transferred electronic mail by the hardware upgrade to produce processed electronic mail; (p. 25, l. 19 – p. 26, l. 7; p. 57, ll. 1-7) and

communicating between the microprocessor (602) of the set top terminal (220) and a microprocessor (p. 57, ll. 6-7) of the hardware upgrade (p. 57, ll. 1-7).

Claim 45 positively recites (with reference numerals, where applicable and cites to at least one portion of the specification added):

45. A hardware upgrade for a set top terminal in a television program delivery system, the hardware upgrade comprising:

a modem (627) for accessing an online service outside of the television program delivery system and for receiving electronic mail from the online service;

a memory (p. 50, ll. 4-6) for storing (i) programming instructions that enable a subscriber to engage in textual interactivity with processing of the electronic mail, and (ii) a mailbox for the transferred and processed electronic mail;

a microprocessor (602) for processing the electronic mail based on the programming instructions and the textural interactivity, the microprocessor (p. 57, ll. 6-7) of the hardware upgrade (p. 25, l. 19 – p. 26, l. 7) capable of communicating with the microprocessor (602) of the set top terminal (220) through an interface (662,720); and

the interface (662,720), for providing an electrical connection between the

set top terminal (220) and the hardware upgrade (p. 25, l. 19 – p. 26, l. 7), and for transferring the processed electronic mail from the hardware upgrade (p. 25, l. 19 – p. 26, l. 7) to the set top terminal (220) for display.

Grounds of Rejection to be Reviewed on Appeal

The Examiner has rejected claims 1 and 16 under 35 U.S.C. §112, ¶1, as failing to comply with the written description and the enablement requirements.

The Examiner has rejected claims 1-2, 4-6, 16-17, 19-21 and 43-45 under 35 U.S.C. §103(a) as being unpatentable over Kauffman (U.S. Patent No. 5,003,591, hereinafter "Kauffman"), in view of Handelman (U.S. Patent No. 5,715,315, hereinafter "Handelman") and Lett (U.S. Patent No. 5,657,414, hereinafter "Lett").

ARGUMENTS

I. THE EXAMINER ERRED IN REJECTING CLAIMS 1 AND 16 UNDER 35 U.S.C. §112 BECAUSE APPELLANTS' PARENT APPLICATION NUMBER 07/991,704, FILED ON DECEMBER 9, 1992, FULLY SATISFY THE REQUIREMENTS OF 35 U.S.C. § 112 ¶1 IN SUPPORTING THE CLAIMS OF THE APPELLANTS' PRESENT APPLICATION.

The Examiner has rejected claims 1 and 16 under 35 U.S.C. §112, ¶1, as failing to comply with the written description and the enablement requirements.

Under 35 U.S.C. §112, paragraph 1, the applicant is required to satisfy the written description and enablement requirements. The relevant portion of the statute requires that "the specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention."

The Examiner asserts that there is no support in the parent application, application number 07/991,704, filed on December 9, 1992 (hereinafter "parent application"), for the limitation of "electronic mail" or a processor on the level B interactive hardware upgrade to receive and process the electronic mail. The Appellants respectfully submit that the parent application fully satisfies the requirements of 35 U.S.C. §112, paragraph 1 in supporting the limitations of the Appellants' independent claims. Thus, the Appellants' priority date is December 9, 1992.

Appellants' parent application recites that interactive features, such as electronic mail, are described with interactive services level B menu and the set top terminal hardware upgrade level B interactive unit. (See parent application, p. 25, l. 19 – p. 26, l. 7) Therefore, the parent application clearly provides support for the "electronic mail" limitation of independent claims 1, 16 and 45.

Moreover, the set top terminal has a microprocessor 602 and a hardware upgrade port 662 (See *Id.* at p. 54 ll. 1-2, FIG. 7b). For example, up to four hardware upgrades are available for a set top terminal 220, including a level B interactive unit to support electronic mail functionality as discussed above. (See *Id.* at p. 54, ll. 15-20) An upgrade module, such as for example the level B interactive hardware upgrade, is connected to a simple decompression box 720 through a port similar to hardware upgrade port 662. (See *Id.* at p. 57, ll. 1-7) The set of wires and the interface connection allows the microprocessor in the upgrade module to communicate to the microprocessor of the simple decompression box. (See *Id.* at p. 57, l. 21 – p. 58, l. 1.) A simple decompression box is similar to a set top terminal in all respects except that it does not have the full functionality of the set top terminal. (See *Id.* at p. 57, ll. 8-10)

As a result, if the level B interactive unit hardware upgrade is to connect to the set top terminal via hardware upgrade port 662 (i.e. a port similar to the hardware upgrade port discussed above), one skilled in the art would know that the level B interactive unit hardware upgrade must have a microprocessor similar to the upgrade module to communicate to the microprocessor of the set top terminal via a similar interface. Moreover, if the level B interactive unit hardware upgrade possesses electronic mail capabilities, as described above, the microprocessor of the level B interactive unit hardware upgrade will receive and process the electronic mail.

Therefore, the Appellants respectfully submit that Appellants' parent application fully satisfy the written description and enablement requirements of 35 U.S.C. §112, ¶1. The Appellants respectfully request the rejection under 35 U.S.C. §112, ¶1 be withdrawn and the Appellants' current application be afforded an effective filing date of December 9, 1992.

II. THE EXAMINER ERRED IN REJECTING CLAIMS 1-2, 4-6, 16-17, 19-21 AND 43-45 UNDER 35 U.S.C. §103(a) BECAUSE HANDELMAN IS NOT A PROPER REFERENCES AGAINST APPELLANTS' INVENTION AND THE COMBINATION OF KAUFFMAN AND LETT FAIL TO RENDER OBVIOUS APPELLANTS' INVENTION AS A WHOLE.

The Examiner has rejected claims 1-2, 4-6, 16-17, 19-21 and 43-45 under 35 U.S.C. §103(a) as being unpatentable over Kauffman, in view of Handelman and Lett.

The effective filing date for the Appellants' invention, as a continuation-in-part, for any claims fully supported under 35 U.S.C. §112 is the date of the earlier parent application. (See MPEP 706.02) For a reference to be properly cited against the Appellants' invention as prior art, the reference must have an earlier effective filing date than the Appellants' effective filing date. (See *Id.*)

Here, as discussed above, the Appellants' independent claims 1, 16 and 45 are fully supported under the requirements of 35 U.S.C. §112 by the Appellants' parent application. The present application is a divisional of U.S. Patent No. 5,990,927 (Application Ser. No. 08/160,194), filed on December 2, 1993, which is a continuation-in-part of U.S. Patent Application Ser. No. 07/991,074, filed on December 9, 1992. Consequently, the Appellants' effective filing date is December 9, 1992.

The Examiner relies on Handelman to support the Examiner's rejection under 35 U.S.C. §103(a). The earliest effective filing date of Handelman is August 19, 1993. Therefore, Handelman is not a proper reference against the Appellants' invention because the Appellants' invention has an earlier effective filing date (i.e., December 9, 1992) than Handelman (i.e., August 19, 1993).

Moreover, the combination of Kauffman and Lett fail to teach or to suggest the Appellants' invention. Kauffman provides a system in which the cable television converter is remotely modifiable via a firmware upgrade, the firmware integrity having been verified prior to execution of new converter functions.

Lett provides an auxiliary device control for a subscriber terminal comprising a bidirectional communication and data interface between the subscriber terminal and one or more auxiliary devices, such as a video cassette recorder. For example, Lett discloses that:

> "The expansion card 138 is a printed circuit card which contains memory and/or secure microprocessor components, which can be plugged into a connector 200. The connector 200 electrically extends the control microprocessor memory bus 141 and the secure microprocessor bus 143 to the expansion card 138. Additional program or data memory, or renewed security can be provided by the expansion card 138." (col. 8, ll. 55-62)

However, Lett does not disclose that the expansion card microprocessor is for processing electronic mail.

Thus, in addition to the teachings relied upon by the Examiner with respect to Handelman, Kauffman and Lett also fail to teach or suggest Appellants' invention as a whole.

Consquently, Appellants submit that independent claims 1, 16 and 45 are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Furthermore, claims 2, 4-6, 17, 19-21 and 43-44 depend, either directly or indirectly, from independent claims 1 and 16 and recite additional limitations thereof. As a result, Appellants submit that these dependent claims are also not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Therefore, Appellants respectfully request that the Examiner's rejection be withdrawn because Handelman is not a proper reference against Appellants' invention and the combination of Kauffman and Lett fail to teach or suggest Appellants' invention as a whole.

CONCLUSION

Thus, Appellants submit that none of the claims presently in the application are allowable under the respective provisions of 35 U.S.C. §§112 and 103.

For the reasons advanced above, Appellants respectfully urge that the rejections of claims 1, 2, 4-6, 16-17, 19-21 and 43-45 are improper. Reversal of the rejections of the Final Office Action is respectfully requested.

Respectfully submitted,

12/19/06
Date

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CLAIMS APPENDIX

1. (Previously presented) A hardware upgrade for enhancing the functionality of a set top terminal in a television program delivery system, each set top terminal adapted to receive electronic mail and having a microprocessor, the hardware upgrade comprising:

an interface for providing an electrical connection to the set top terminal, whereby digital data, including the electronic mail, is transferred from the set top terminal for processing and the processed electronic mail is passed to the set top terminal for display; and

at least one microprocessor connected to said interface for processing the electronic mail to produce processed electronic mail, the microprocessor of the hardware upgrade capable of communicating with the microprocessor of the set top converter through the interface.

2. (Original) The hardware upgrade according to claim 1, wherein said television program delivery system comprises digital video.

3. (Cancelled).

4. (Previously presented) The hardware upgrade according to claim 1, wherein the interface comprises:

circuitry for receiving subscriber inputs from the set top terminal, wherein the received subscriber inputs include textual information that is used to produce the processed electronic mail and for transferring the processed electronic mail to the set top terminal for display.

5. (Previously presented) The hardware upgrade according to claim 1, for use with on-line databases, interactive services and message services outside of the television program delivery system, wherein the hardware upgrade enables the set top terminal to use a telephone modem adapted to provide

communications capability with the on-line databases, interactive services and message services.

6. (Previously presented) The hardware upgrade according to claim 4, further comprising:

a memory connected to the at least one microprocessor for storing the processed electronic mail.

7-15. (Cancelled)

16. (Previously presented) A method for use with a set top terminal in a television program delivery system, each set top terminal adapted to receive electronic mail and having a microprocessor, the method comprising the steps of:

providing an electrical connection between the set top terminal and a hardware upgrade, whereby digital data, including the electronic mail, is transferred from the set top terminal for processing;

processing the transferred electronic mail by the hardware upgrade to produce processed electronic mail; and

communicating between the microprocessor of the set top terminal and a microprocessor of the hardware upgrade.

17. (Original) The method according to claim 16, wherein said television program delivery system comprises digital video.

18. (Cancelled)

19. (Previously presented) The method according to claim 16, wherein said step of providing an electrical connection to the set top terminal further comprises:

receiving subscriber inputs from the set top terminal, wherein the received subscriber inputs includes textual information that is used to produce the

processed electronic mail; and

transferring the processed electronic mail to the set top terminal for display.

20. (Original) The method according to claim 16, further comprising the step of communicating with on-line databases, interactive services and message services outside of the television program delivery system.

21. (Original) The method according to claim 19, further comprising the step of:

storing the processed electronic mail.

22-42. (Cancelled)

43. (Previously presented) The hardware upgrade of claim 1, wherein the hardware upgrade enables the subscriber to engage in textural interactivity using overlay menus.

44. (Previously presented) The hardware upgrade of claim 1, wherein the microprocessor of the set top terminal is capable of coordinating reception of signals from the television program delivery system and interacting with an upstream data transmitter.

45. (Previously presented) A hardware upgrade for a set top terminal in a television program delivery system, the hardware upgrade comprising:

a modem for accessing an online service outside of the television program delivery system and for receiving electronic mail from the online service;

a memory for storing (i) programming instructions that enable a subscriber to engage in textual interactivity with processing of the electronic mail, and (ii) a mailbox for the transferred and processed electronic mail;

a microprocessor for processing the electronic mail based on the

programming instructions and the textural interactivity, the microprocessor of the hardware upgrade capable of communicating with the microprocessor of the set top terminal through an interface; and

the interface, for providing an electrical connection between the set top terminal and the hardware upgrade, and for transferring the processed electronic mail from the hardware upgrade to the set top terminal for display.

EVIDENCE APPENDIX

1. Parent Application - U.S. Patent Application Ser. No. 07/991,074, filed on December 9, 1992.
2. U.S. Patent Application Ser. No. 07/991,074, Figures 1 – 9b of 134.

RELATED PROCEEDINGS APPENDIX

None.

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN, that I, John S. Hendricks, a citizen of the United States and a resident of Montgomery County, Maryland, have invented certain new and useful improvements in

TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM WITH MENU DRIVEN SUBSCRIBER ACCESS

of which the following is a specification.

BACKGROUND OF THE INVENTION

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to cable television packaging, delivery and presentation systems which provide consumers with many television programming options.

Advances in television entertainment have been primarily driven by breakthroughs in technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided consumers with increased programming to homes.

Many of these technology breakthroughs have produced inconvenient systems for consumers. One example is the ubiquitous three remote control home, having a separate and unique remote control for the TV, cable box and VCR. More recently, technology has provided cable users in certain parts of the country with 100 channels of programming. This increased program capacity is beyond the ability of many consumers to use effectively. No method of managing the program choices has been provided to consumers.

Consumers are demanding that future advances in television entertainment, particularly programs and program choices, be presented to the consumer in a user friendly manner. Consumer preferences, instead of technological breakthroughs, will drive the television entertainment market for at least the next 20 years. As computer vendors have experienced a switch from

marketing new technology in computer hardware to marketing better useability, interfaces and service, the television entertainment industry will also experience a switch from new technology driving the market to consumer useability driving the market.

Consumers want products incorporating new technology that are useful, and will no longer purchase new technology for the sake of novelty or status. Technological advances in sophisticated hardware are beginning to surpass the capability of the average consumer to use the new technology. Careful engineering must be done to make entertainment products incorporating new technology useful and desired by consumers.

In order for new television entertainment products to be successful, the products must satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety of choices, from no control of programming to complete control. Consumers wish to advance from cumbersome and inconvenient television to easy and convenient television and keep costs down. Consumers do not wish to pay for one hundred channels when due to lack of programming information, they seldom, if ever, watch programming on many of these channels.

The concepts of interactive television, high definition television and 300 channel cable systems in consumer homes will not sell if they are not packaged, delivered and presented in a useable fashion to consumers. The problem is that TV

programming is not being managed, packaged, delivered, and presented to consumers in a user friendly manner.

Consumers are already being bombarded with programming options, numerous "free" cable channels, subscription cable channels and pay-per-view choices. Any further increase in TV entertainment choices, without a user friendly presentation and approach, will likely bewilder viewers with a mind-numbing array of choices.

The TV industry has traditionally marketed and sold its programs to consumers in bulk, such as continuous feed broadcast and long-term subscriptions to movie channels. The TV industry is unable to sell its programming in large quantities on a unit per unit basis, such as the ordering of one program. Consumers prefer a unit sales approach because it keeps costs down and allows the consumer to be more selective in their viewing.

Additionally, viewership fragmentation, which has already begun, will increase. Programming not presented in a user friendly manner will suffer with a decrease in viewership and revenue.

What is needed is an economical system which can gather television programming in a variety of formats, package the programs, deliver the programs, and present the programs through a user friendly interface which allows the consumer to easily select from among the many program choices. The system must be capable of handling hundreds of programs in different formats, be expandable for

future types of programming, include a method for billing consumers, and be inexpensive. The present invention is addressed to fulfill these needs.

SUMMARY OF INVENTION

The present invention is an expanded cable television program delivery system that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The present invention is a program delivery system which provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers will be able to access the expanded program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access, allowing the subscriber to access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of single buttons, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given

menu. The programs are grouped by category so that similar program offerings are found on the same menu.

B. System Description

1. Major System Components

In its most basic form, the system uses a program delivery system in conjunction with a conventional cable television system. The program delivery system contemplates (i) at least one operations center, where program packaging and control information are received and then assembled in the form of digital data, and (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission (i.e. modulated, upconverted and amplified). The program delivery system transports the digital signals to the concatenated cable television system where the signals are received at the cable headend. Within the cable headend, the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism and then transmitted to subscriber homes via the cable system.

The delivery system employs an in-home decompression capability employing a decompressor housed within a set-top terminal in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection of a corresponding program by the subscriber. Within the set-top

terminal, video signals are converted into analog signals. Control signals are extracted, decompressed and either executed immediately or placed in local storage in a ROM. The program control signals correspond to specific television programs with menu program options that each subscriber may access through a subscriber interface. The subscriber interface is a combined alpha, numeric and iconic remote control device which provides direct or menu-driven program access.

An array of menu templates are generated by a either a computer program within the set-top terminal or by the cable headend. The menu templates are generated using the program control information signals received from the Operations Center. A computer program within the set top terminal generates the on-screen menu displays and allocates a specific menu program option for each program signal. A combined alpha and numeric remote control device provides the user interface to each program signal, allowing selection of a specific menu option which corresponds to a particular program signal.

2. Operations Center and Digital Compression System

The Operations Center performs two primary services, packaging television programs and [illegible] signal. At the Operations Center television programs are accumulated from various sources in both analog and digital form. The programs are then packaged into groups and categories which allow for easy menu access to programs and provides optimal marketing of programs to subscribers. The packaging process also accounts for any groupings by transponder which are necessary. After a packaging scheme is developed, the

program control information which, among other things, describes the packaging, is generated by a computer and delivered with the packaged programs to the head end and/or subscriber. The system also accommodates local cable and television companies with programming time for local advertising and/or programming time availability.

The delivery system employs digital compression techniques to increase existing satellite transponder capacity by at least a 6:1 ratio, resulting in a six-fold increase in program delivery capability. The input signals are compressed, combined and encoded prior to satellite transmission, and subsequently transponded to various receive sites. There are a number of compression algorithms that presently exist which can achieve the resultant increase in capacity and improved signal quality desired for the invention.

3. System Control

Network management, control and monitoring of all compressors and decompressors in the network, is performed by a network controller at the cable headend, where program selection activity, and account and billing information is monitored. In the preferred embodiment, the network controller monitors, among other things, authorization poll-back responses from the set-top terminals remotely located at each subscriber's home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller will be

stored in ROM within each subscriber's set-top terminal and retrieved only upon polling by the network controller.

Control information from the set-top terminal would be sent to the network controller at the cable headend and not directly to the operations center.

The digital compression and delivery system of the preferred embodiment provides a one-way path from the Operations Center to the cable headend. Thus, program monitoring and selection control will take place only at the cable headend by the local cable company and its decentralized network controllers (i.e., decentralized relative to the Operations Center which is central to the program delivery system). The local cable company will in turn be in communication with the operations center or a regional control center which accumulates return data from the set-top terminal for statistical or billing purposes. Alternatively, the operations center, and statistical and billing sites could be collocated.

4. Menu-Driven Program Selection

At a given receive site, any of the compressed signals may be demultiplexed or individually extracted from the data stream and passed from the cable headend over the cable system to the subscriber's set-top terminal. Within the set-top terminal, the individual compressed signals are decompressed and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the screen. A combined alpha, numeric and iconic remote control device provides the subscriber interface to the system.

Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or by directly accessing a specific channel by its actual number. The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by alpha character access. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection. The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control and pressing the corresponding channel number, or one of the menu icon selection options.

It is an object of the invention to provide a user friendly interface for subscribers to access television programs.

It is an object of the invention to efficiently package and deliver television programs to subscriber homes.

It is an object of the invention to allow users to easily navigate through hundreds of programming choices using on-screen menus.

It is an object of this invention to allow subscribers to select a program from among hundreds of choices without a television viewing guide.

It is an object of this invention to efficiently utilize digital compression techniques to deliver hundreds of television program options to subscribers' homes.

It is an object of this invention to provide pay-per-view type program access in the same system as specialty channel and broadcast television access.

It is an object of this invention to allow users to subscribe on-screen to specialty channels.

It is an object of this invention to provide centralized national system of program packaging and delivery for cable television.

It is an object of this system to provide a centralized program packaging and delivery system with the capability for incorporating local availability of program and advertising time.

It is an object of this invention to monitor subscriber viewing choices for statistical purposes.

It is an object of this invention to provide on-screen billing information to subscribers.

It is an object of this invention to provide sophisticated on-screen television menus which can incorporate still video and moving video.

It is an object of this invention to provide a system capable of advertising products and services with on-screen television menus.

It is an object of this invention to provide a user friendly system capable of offering High Definition Television (HDTV) programs.

It is an object of this invention to provide a user friendly system capable of offering interactive television services.

It is an object of this invention to provide a user friendly cable system capable of supplying both television programming and digital audio programming.

It is an object of this invention to provide a system which offers HDTV, interactive services, and digital audio programming.

It is an object of its invention to provide a more compelling way for cable operators to promote not only their pay per view options, but also to promote their current offerings of cable service through menu and screen generation for local, customized programming of menu screens.

It is an object of this invention to allow subscribers to access digitally compressed audio channels with the same decompression system used for their television.

These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

DESCRIPTION OF THE DRAWINGS

Figure 1. Figure 1 is a schematic of the overall system design.

Figure 2. Figure 2 is a schematic of the primary components of the invention.

Figure 3a. Figure 3a is a diagram of the bandwidth allocation for a 750 mHz system.

Figure 3b. Figure 3b is a diagram/chart of the compressed channel allocation for the system.

Figure 3c. Figure 3c is a diagram showing how three cable television systems with different bandwidths may use the program delivery system of the present invention simultaneously.

Figure 3d. Figure 3d is a diagram showing three different cable headend systems, each system receiving the entire satellite signal and stripping those parts of the signal which cannot be handled by the local cable system.

Figure 3e. Figure 3e is a diagram showing dynamic change in bandwidth allocation from a typical week day prime time signal.

Figure 4a. Figure 4 is a block diagram of the Operations Center and Master Control Site.

Figure 4b. Figure 4b is a block diagram of the computer assisted packaging shown in Figure 4a.

Figure 5. Figure 5 is a flow chart of the processing occurring at the Operations Center.

Figure 6. Figure 6 is a chart of the program control information carried by the program control information signal.

Figure 7a. Figure 7a is a block diagram of the internals of the set top terminal.

Figure 7b. Figure 7b is a block diagram of an alternative embodiment of the internals of the set top terminal.

Figure 8a. Figure 8a is a perspective front view of a set top terminal.

Figure 8b. Figure 8b is a perspective rear view of a set top terminal.

Figure 9a. Figure 9a is a schematic of a basic decompression box and upgrade module, with the associated connections.

Figure 9b. Figure 9b is a schematic of an alternative embodiment of a simple decompression unit and upgrade module, with associated connections.

Figure 10a. Figure 10a is a drawing of storage for on-screen menu templates stored in graphics memory of the set top terminal.

Figure 10b. Figure 10b is a drawing showing the hierarchical storage of graphics memory for the set top terminal.

Figure 10c. Figure 10c is a drawing of a flow chart showing the steps required for the microprocessor to retrieve, combine and display a menu.

Figure 10d. Figure 10d is a drawing of a flow chart showing the steps required for the microprocessor to sequence program menus.

Figure 11a. Figure 11a is a schematic showing the two parts of a remote control unit.

Figure 11b. Figure 11b is a drawing of the complete remote control derived from Figure 11a.

Figure 12a.	Figure 12a is a color photograph showing a perspective view of the preferred remote control unit of the present invention.
Figure 12b.	Figure 12b is another drawing of the preferred remote control unit shown in Figure 12a.
Figure 13.	Figure 13 is a flow chart of the progression of primary menus in the menu driven system of the set top terminal.
Figure 14a.	Figure 14a is a drawing of the basic menus used in the present invention, including the ten major menus represented by icons.
Figure 14b.	Figure 14b is a drawing of the basic menus used in the present invention, in addition to Figure 14a.
Figures 15a-15c.	Figures 15a-15c are drawings of introductory menus.
Figures 16a-16d.	Figures 16a-16d are drawings of home menus.
Figure 17.	Figure 17 is a drawing of an alternative of a home menu.
Figures 18a-18g.	Figures 18a-18g are drawings of major menus.
Figures 19a-19b.	Figures 19a-19b are drawings of hit movie description menus.
Figures 20a-20b.	Figures 20a-20b are drawings of hit movie confirmation submenus.
Figures 21a-21b.	Figures 21a-21b are drawings of hit movie notification submenus.
Figure 22a.	Figure 22a is a drawing of a hit movie escape during program menu.

Figure 22b.	Figure 22b is a drawing of a hit movie during program hidden menu.
Figure 22c.	Figure 22c is a drawing of a hit movie re-entry submenu.
Figure 23.	Figure 23 is a drawing of a movie library major menu.
Figure 24.	Figure 24 is a drawing of a hit movie description menu.
Figure 25.	Figure 25 is a drawing of a movie library confirmation submenu.
Figures 26a-26b.	Figures 26a-26b are drawings of major menus.
Figures 27a-27b.	Figures 27a-27b are drawings of submenus for the major menus shown in Figures 26a-26b.
Figures 28a-28b, Figures 29a-29c.	Figures 29a-28b and Figures 29a-29c are drawings showing examples of submenus for the menus shown in Figures 27a-27b.
Figure 30.	Figure 30 is a drawing of a specialty channel major menu.
Figures 31-34.	Figures 31-34 are drawings of submenus related to Figure 30.
Figure 35.	Figure 35 is a drawing of a magazine channel major menu.
Figures 36-38.	Figures 36-38 are drawings of submenus related to Figure 35.
Figure 39.	Figure 39 is a drawing of a documentary/news major menu.
Figures 40-42.	Figures 40-42 are drawings of submenus related to Figure 39.
Figure 43.	Figure 43 is a drawing of an entertainment choice major menu.
Figure 44.	Figure 44 is a drawing of a submenu related to Figure 43.
Figure 45.	Figure 45 is a drawing of a children's programs major menu.
Figure 46.	Figure 46 is a drawing of a program description submenu related to Figure 45.

Figure 47.	Figure 47 is a drawing of a sports major menu.
Figures 48, Figures 49a-49d.	Figures 48 and 49a-49d are drawings of submenus related to Figure 47.
Figures 50a-50b.	Figures 50a-50b are drawings of menus related to high definition television programming.
Figures 51a-51f.	Figures 51a-51f are drawings of menus related to program guide services.
Figures 51g-51h.	Figures 51g-51h are drawings of broadcast television menus.
Figures 51i-51k.	Figures 51i-51k are drawings of mood question menus.
Figures 52a-52c.	Figures 52a-52c are drawings of interactive television promotional menus, for Levels A-C.
Figures 52d-52j.	Figures 52d-52j are drawings of submenus for interactive television services, Level A.
Figures 53a-53l.	Figures 53a-53l are drawings of interactive services, Level B, particularly related to on-screen airline reservations.
Figures 54a-54e.	Figures 54a-54e are drawings of menus for digital audio services.
Figures 55a-55g.	Figures 55a-55g are drawings of the various overlaying screens necessary for creating a hit movie major menu.
Figures 56a-56g.	Figures 56a-56g are drawings of the various overlaying screens necessary for creating a hit movie description submenu.
Figures 57a-57b.	Figures 57a-57b are drawings showing use of split screen techniques.

Figures 58a-58b, Figures 59a-59b. Figures 58a-58b and 59a-59b are drawings of monthly account menus.

Figure 60. Figure 60 is a drawing of the statistical and billing system used in the present invention.

Figures 61-98. Figures 61-98 are color photographs of many of the menus presented in the preceding Figures.

Figure 99. Figure 99 is a color photograph showing an enlargement of the cursor movement buttons and the "go" button to activate each menu.

Figures 100-134. Figures 100-134 are color photographs of many of the menus presented in the preceding Figures.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows an overview of the cable television menu driven program delivery system 200. The Operations Center 202 is shown receiving external programming signals which correspond to particular programming categories that are available for a subscriber's viewing. These external signals may be in analog or digital form and may be received via landline, microwave transmission, or satellite. Some of these external signals may be transmitted from the program source to the Operations Center 202 in compressed digital format or other nonstandard digital formats. These external signals are received and packaged

along with programming that is stored at the Operations Center 202 (not shown here).

Examples of external program sources 204 shown in Figure 1 are: Sporting events, children's programs, documentaries, high definition TV sources, specialty channels, interactive services, weather, news, and other nonfiction or entertainment. Any source that can provide either audio or video or both may be utilized to provide programming to the Operations Center 202.

After packaging, the packaged television program signal is prepared for satellite transmission 206 and sent from the Operations Center 202 to the cable headend 208 via satellite transmission 206. Depending on the specific embodiment, the television program signal may need to be compressed, combined/multiplexed, encoded, mapped, modulated, upconverted and amplified. This system, which is intended to be compatible with existing C and Ku Band satellite transmission 206 technologies, accepts video, audio and data signals ranging in signal quality, and input from a number of sources.

Upon receipt of the programming signal at the cable headend 208, the signal is again treated if necessary and sent into a concatenated cable system to the subscriber's home. The signal reaches the subscriber's home in a compressed format and must be decompressed prior to viewing. Included in the delivered program signal is information which enables equipment at the subscriber's home to display menus for choosing particular programs. Depending on the particular embodiment, the television program signal may arrive at the subscriber's home via one or more

coaxial cables, fiber cables, twisted pairs, cellular telephone connections, or personal communications network (PCN) hookups.

This connection between the subscriber's home and the cable headend 208 allows for two-way communications. Utilizing this two-way communications, the cable headend 208 receives information about a subscriber's account, billing, and programs viewed. Also, the cable headend 208 is capable of sending computer data or computer software information to the subscriber's home.

As shown in Figure 1, an analog cable TV system 210 can continue to exist alongside and within the digitally compressed system of the present invention. The digital transmissions do not effect the analog system. In fact, the analog cable signal may be transmitted simultaneously on the same cable as the digital signal. The cable headends may continue to supply subscribers with local channels in an analog signal format.

Figure 2 shows a more detailed overview of the operation of the present invention. The Operations Center 202 shown performs program packaging and delivery control. In the preferred embodiment, the packaged program signal will be treated at a master control uplink site 211 prior to being transmitted to the satellite 206. Various satellite multi-accessing schemes and architectures can be used with the system, including both single channel per transponder time division multiplex (TDM) and multiple channel per transponder single channel per carrier (SCPC). Time division multiplexing is the more desirable scheme. The signal is transmitted from the satellite 206 to the cable headend 208 where a computer system

including a digital switch treats the signal and delivers it through cables to a subscriber's home. In alternate embodiments, multiple Operations Center 202 and multiple uplink sites can be simultaneously utilized.

In the embodiment shown in Figure 2, two cables 216 are used between the cable headend 208 and the subscriber's home. In this particular embodiment, analog signals, digitally compressed signals, other digital signals and up-stream/ interactivity signals are sent and received over the two cables 216.

The cable headend 208 receives the digitally compressed and multiplexed signal from the satellite 206 and processes the signal for further distribution to the subscriber homes. The cable headend 208 performs two primary functions in the cable delivery system. It will act as a signal processor 212 and distribution center for routing the digitally compressed signals to subscribers and it will act as a network controller 214 receiving information from subscribers and passing the information on to the Operations Center 202 or other remote sites (such as regional, statistical and billing sites not shown). In order to perform these two functions, the cable headend 208 of the preferred embodiment is equipped with two computer processors working in unison. Use of two processors performing different functions increases the speed and capability of the cable headend 208 without a significant increase in cost. One processor, the signal processor 212, handles the receiving and processing of the satellite 206 signal for distribution to subscribers. The second processor acts as a network controller 214 and monitors activity of the subscriber's set top terminal 220. The cable headend 208 can be operated by one CPU

or a series of CPU's which perform the signal processing and network control functions.

The signal processor 212 will treat the signal as necessary for use by the subscriber's set top terminal 220. In the simplest embodiment, the amount of processing that is necessary by the signal processor 212 is limited to demultiplexing and frequency allocation. However, in alternative embodiments, the signal processor 212 demultiplexes the signal, allocates frequencies and then re-multiplexes the signal using a different multiplexing scheme prior to the signal's distribution to the subscriber. In addition, for embodiments in which the control of local availability time is desired at the cable headend 208, the signal processor 212 must be capable of compressing and adding additional signals to the satellite 206 signal. In order to incorporate local programming, the signal processor 212 would demultiplex the satellite 206 signal, compress the local programming, combine the compressed local program with the satellite 206 signal and then multiplex the signal prior to delivery to the subscriber terminals. Most of the activities necessary for incorporating local programming will be automatically performed by the signal processor 212. In the preferred embodiment, the signal processor 212 incorporates all the necessary digital switching capability to serve numerous subscribers.

Signals received by the cable headend 208 must be decompressed before transmission from headend to subscriber location only when the compression algorithm used for the cable system differs from the one used for satellite transmission 206. This difference may result from different bandwidth constraints

between the cable transmission media and the satellite 206 transponder. Such a difference would necessitate the use of separate compression algorithms to maintain desired signal quality and throughput over both of the transmission mediums.

System control is performed by the network controller 214. The primary task of the network controller 214 at the cable headend 208 is to manage the configuration of the set top terminals, which includes receiving and processing signals from the set top terminal units. The network controller 214 must also monitor selections at subscribers' homes, maintain accurate account and billing information, authorize subscriber channel access, and authorize particular set top terminals to operate in the system. Information required to operate the network will be stored in memory (either in RAM, ROM, magnetic or optical Read/Write) at the cable headend 208 and also in memory (RAM and/or ROM) within each subscriber's set top terminal 220. Two-way communications between the network controller 214 and set top terminal 220 will occur over cable lines. Interactive television programming can be accommodated through the network controller 214. In addition, the network controller 214 will be able to access set top terminals via phone lines for trouble shooting, special features or sophisticated reprogramming.

The network controller 214 regularly polls each set top terminal 220 to acquire needed information to operate the system. The network controller 214 sends signals to set top terminals to authorize their operation and to authorize access to specific channels. If a subscriber has failed to pay a recent bill, the network controller 214 can deauthorize the subscriber's set top terminal 220. When a

subscriber orders a program or channel the network controller 214 checks the subscriber's account for good standing and then authorizes the access by signaling the set top terminal 220.

To perform its functions, the network controller 214 must work closely with the signal processor 212. In many instances the program control information signal received from the Operations Center 202 must be modified prior to being sent to the set top terminals. These modifications to the program control information are made by the network controller 214 working in conjunction with the signal processor 212 to send a set top terminal 220 control information stream (STTCIS). From the signal processor 212, the network controller 214 receives the program control information signal which includes cable franchise specific information added by the Operations Center 202. The network controller 214 modifies the program control information signal, if necessary, and communicates the new information to the signal processor 212. The signal processor 212 then forwards the information to the set top terminal 220 in the form of the STTCIS. In most instances the network controller 214 will modify the program control information signal by adding additional information. In a simple embodiment the program control information signal can be passed through the cable headend 208 to the set top terminal 220 without any modifications.

Although the signal processor 212 will handle the addition of simple local availabilities (e.g. local advertisements) into the signal sent to the set top terminal 220, the network controller 214 will handle any of the more sophisticated

local programming needs such as interactive programming and certain data services. The network controller 214 will receive any electronic signals sent by the set top terminal 220 including those in response to interactive service requests and some data service requests. The network controller 214 coordinates the necessary switching and access to allow the subscriber to enjoy these services.

The network controller 214 has the capability of performing "on the fly programming" changes, assisting in masking portions of subscriber's television screens (split screen video), assist in selecting different audio signals for the same video (foreign languages), assist in interactive features, create tiered programming, etc. For last minute changes to programming (such as for a local emergency or important regional events), an operator using the network controller 214 can modify the program control information signal "on the fly" and change menus available to the subscriber. This accommodates short notice changes to program packaging that can not be provided to the Operations Center 202 in advance. In order to accommodate split screen techniques for promo and demo video (which will be described later), those undesired video portions of the screen must be masked. The network controller 214 can send the necessary control information to inform the set top terminal 220 to mask portions of a specific channel's video. For example, a video channel with a split screen showing four separate videos would require a 3/4 mask to focus the viewer on the featured video clip.

Tiered programming allows different users to view different video even though they are "tuned" to the same channel. For example, the network

controller 214 may know the demographics of its subscriber's through a database, by "learning" from prior subscriber choices, from an interactive selection, or from other means. Using the demographics information, the network controller 214 may target commercials to the correct audience by showing different commercials to subscriber's with different demographics. Even though subscriber's will believe they are "tuned" to one channel, they will be switched to a different channel for the tiered video. Alternatively, the subscriber's may be offered an option of several commercials from which to choose.

To accommodate foreign speaking subscribers, multiple audio channels for television programming may be provided. The subscriber may be shown menus of programs available in his native language. The function of choosing the correct audio to correspond to the selected language may be handled by either the set top terminal 220 or the network controller 214 depending upon the configuration. Local programming in several languages or additional audio channels for a foreign language translation of a popular television program may be provided by the network controller 214. Using a picture-on-picture feature, sign language may be similarly made available to certain set top terminals for the deaf. Also, a text overlay may be easily produced on the lower part of the screen for the deaf.

In the more sophisticated and expensive embodiments, the network controller 214 can act as a central computer and provide intra-set top terminal interactive games, inter-set top terminal interactive games, computer bulletin board type services, message services (Electronic mail) etc. For example, a subscriber may

play war games with six of his (anonymous) fellow subscribers each in their own home each operating a separate tank. The network controller 214 gathers the players via set top terminal communications and acts as the referee. A bulletin board or message system can be set up to discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts. These interactive features are further described below with the interactive services level B menu and the set top terminal hardware upgrade level B interactive unit.

Also shown in Figure 2 is the set top terminal 220 that receives the signals from the cable headend 208 and manipulates them for the subscriber. The set top terminal 220 is equipped with local computer memory and the capability of interpreting the digitally compressed signal to produce menus for the subscriber. Although the set top terminal 220 is shown on top of the subscriber's television 222, it may be placed anywhere in the subscriber's home that is accessible by the remote control. The remote control communicates the subscriber's selections to the set top terminal 220. The subscriber's selections are generally based upon menus or other prompts displayed on the television screen. A typical menu is shown in Figure 2 on the television screen.

One of the achievements of the present invention is effective utilization of digital compression technology by packaging television programs into categories that allow easy access to television programs by consumers. With current digital compression techniques for video, the typical 50-channel capacity cable satellite receiving system can be increased to 300 channels. Presently, one

transponder is used for each satellite delivered channel. The preferred embodiment uses 18 satellite transponders and compression ratios of 4/1 to 8/1 to achieve a capacity of 136 satellite delivered channels. More transponders or higher compression ratios can be used to deliver up to the channel capacity of any existing cable system.

Typical program packaging and delivery first involves the digitizing of the video signals. This is then followed by one of a variety of digital compression techniques that are available. Following compression the channels must be multiplexed and sent to the satellite 206 dish that will provide the uplink. A variety of multiplexing schemes may be used in the system. In some situations, it may be advantageous to use different multiplexing schemes in different parts of the overall system. In other words, one multiplexing scheme may be used for satellite transmission 206 and a second remultiplexing scheme for the land transmission.

Once the signal has arrived at the uplink or master control site, it must be modulated, upconverted, and amplified. Various types of satellites and transponders capable of handling digital signals may be used in this cable television packaging and delivery system. An example of a digital satellite that may be used is the AT&T Telstar 303.

In order to achieve the required throughput of video and audio information for the system, digital compression techniques for video are employed. A television signal is first digitized. The object of digitization is two-fold: First, in the case of an analog signal, like a television picture, digitization allows the signal to

be converted from a wave-form into a digital binary format. Secondly, standard digital formats are designed to have the resulting pictures or video stills take up less space on their respective storage mediums. Essentially, standard digital formats define methods of compression.

A video screen is divided into picture elements known as pixels. Images define one pixel at a time are referred to as "bit-mapped" images. Most compression techniques take the bit-mapped images and convert them into a series of mathematical algorithms both to reduce storage space and to allow for the mathematical manipulation of images that is often not possible with analog formats. This is possible because many images have pixels that repeat themselves. For example, a photograph of a blue, cloudless sky will have a great number of "repeating" picture elements. This redundancy can be represented with great precision by mathematical formulas. Finally, once images have digitized, the standard digitized formats also include techniques required to re-render the images into their final form, either fully bit-mapped or into an analog wave-form. There are three basic digital compression techniques: within-frame (intraframe), frame-to-frame (interframe), and within-carrier. Intraframe compression processes each frame in a television picture to contain fewer visual details and, therefore, the picture contains fewer digital bits. For example, information on blocks of pixels is sent rather than individual digitized pixels themselves. A six by six block of pixels contains thirty-six pixels. Each pixel can be defined by an eight-bit word. Therefore, a six by six block of pixels equals two hundred eighty-eight bits. If the information

on the block rather than the individual pixels themselves, is transmitted, this reduces the amount of information transmitted. Blocks of various sizes may be used as is known by those skilled in the art.

Interframe compression transmits only changes between frames, thus omitting elements repeated in successive frames. Motion prediction technology and motion detection technology are necessary to determine what portions of a changing picture may be compressed. Therefore, if a block does not vary between several frames, the block is transmitted once, and repeated at the receive site for successive frames.

Within-carrier compression allows the compression ratio to dynamically vary depending upon the amount of changes between frames. If a large number of changes occur between frames, the compression ratio drops from, for example, sixteen-to-one to eight-to-one. If action is intense, the compression ratio may dip to four to one.

Various compression methods are used for the above techniques. In vector quantization, a block is compared to a library of standard blocks and a best fit comparison is made between the two. Each block in the library has a corresponding sixteen bit code. Only this code is transmitted to represent the block, rather than the actual block of pixels itself. Therefore, a two hundred eighty-eight bit block of pixels is converted into a sixteen bit code resulting in a compression ratio of: 288 bits/16 bits = 18. The converse process is performed at the receive site to convert the sixteen bit codes into two hundred eighty-eight bit blocks for reproduction on a television

receiver. Other types of compression are known to those skilled in the art, including, for example, discrete cosine transform ("DCT").

Several standard digital formats representing both digitizing standards and compression standards have been developed. For example, JPEG (joint photographic experts group) is a standard for single picture digitization. Motion picture digitization may be represented by standards such as MPEG or MPEG2 (motion picture engineering group specification). Other proprietary standards have been developed in addition to these. Although MPEG and MPEG2 for motion pictures are preferred in the present invention, any reliable digital format with compression may be used with the present invention.

Various hybrids of the above compression techniques have been developed by several companies including AT&T, Compression Labs, Inc., General Instrument, Scientific-Atlanta, Philips, and Zenith. As is known by those skilled in the art, any of the compression techniques developed by these companies, and other known techniques, may be used with the present invention.

Figure 3a shows effective allocation of 750 mHz of bandwidth for television programming. In Figure 3a bandwidth is allocated for both analog and digitally compressed signals. In the preferred embodiment, the bandwidth is divided so that each category of program receives a portion of the bandwidth. These categories correspond with major menus of the user interface software. The representative categories shown in figure 3a include: (1) high definition TV made possible through the use of compression technology, (2) A La Carte Channel category

which provides specialty channels for subscription periods such as monthly, and (3) pay-per-view.

Figure 3b shows a chart of compressed channel allocation for a variety of programming categories that have been found to be desirable to subscribers. By grouping similar shows or a series of shows into blocks of channels, the system is able to more conveniently display similar programming with on-screen television menus. For example, in the movie category, which has the greatest allocation of channels, the same movie may be shown continuously and simultaneously on different channels. Each channel starts the movie at a different time allowing the subscriber to choose a more suitable movie starting time.

In order to accommodate cable TV systems that have different bandwidths and channel capacities, the television programming and television program control information may be divided into parts such as priority one, two, three. The large bandwidth cable TV systems can accommodate all the parts of the television programming and all parts of the television programming control information. Those cable TV systems with a more limited bandwidth are able to use the program delivery system 200 by only accepting the number of parts that the cable system can handle within its bandwidth.

For instance, as is shown in Figure 3c, three cable television systems with different bandwidths may use the program delivery system 200 simultaneously with each system accepting only those parts of the information sent which it is capable of handling. Priority one television programming and menus 230 are

accepted by all three systems. Priority two television programming and menus 233 are not accepted by the cable television system whose capacity is the smallest or in this case 330 mHz (40 channels) system. Priority two television programming and menus 233 are accepted and used by the two larger capacity cable television systems shown. Priority three television programming and menus 236 are only used by the largest capacity television system which is capable of handling all three parts -- Priority one, two and three programming and menu information.

With this division of television programming and menus, the program delivery system 200 may be utilized simultaneously by a variety of concatenated cable systems with varying system capacities. By placing the heavily watched or more profitable programming and menus in the Priority one division, both users and owners of the cable TV systems will be accommodated as best as possible within the limited bandwidth.

Figure 3d shows three different cable headend 208 systems, each system receiving the entire satellite signal from the Operations Center 202 and stripping those parts of the signal which cannot be handled by the local cable system due to bandwidth limitations. In this particular embodiment, the three local cable television systems shown have bandwidth limitations which correspond with the bandwidth limitations depicted in the previous Figure 3c. As the bandwidth decreases, the programming options available to the viewer in the exemplary on-screen menu decreases. Using this preferred embodiment, the Operations Center 202 is able to send one identical signal to the satellite 206 that is sent to all the cable

headends. Each cable headend 208 accepts the entire signal and customizes the signal for the local cable system by stripping those portions of the Operations Center 202 signal that are unable to be handled by the local cable system. An alternate embodiment requires the Operations Center 202 to send different signals for reception by different capacity cable headends.

There are several ways in which the cable headend 208 may strip the unnecessary signal from the Operations Center 202. A person skilled in the art will derive many methods from the three examples discussed below. One simple method is for the cable headend 208 receiver to receive the entire signal and then manipulate the signal to strip away those unnecessary portions. A second method is for the signal to be sent in three portions with each portion having a separate header. The cable headend 208 would then recognize the headers and only receive those signals in which the proper header is identified. For the second method, the Operations Center 202 must divide the signal into three parts and send a separate header lead before each signal for each part.

The third and preferred method is for a set of transponders to be assigned to one priority level and each cable headend 208 to receive signals from the transponders corresponding to the proper priority level. For example, if there are three priority levels and 18 transponders, transponders one through nine may be assigned to priority level one, transponders ten through fourteen priority level two, and transponders fifteen through eighteen assigned to priority level three. Thus, a

cable headend 208 capable of operating at priority level two only would only receive signals from transponders one through nine, and ten through fourteen.

In addition to dividing the television programming and menus into parts, the Operations Center 202 of the preferred embodiment is also capable of dynamically changing the bandwidth allocation for a particular category of programming. Figure 3e depicts this dynamic change in bandwidth allocation from a typical week day prime time 238 signal to a Saturday afternoon in October 240 (during the college football season). Figure 3e highlights the fact that the bandwidth allocated to sports is limited to eight selections during week day prime time 238 but is increased to sixteen selections during a Saturday afternoon in October 240. This dynamic increase in bandwidth allocation allows the system to accommodate changes in programming occurring on an hourly, daily, weekly, monthly, seasonal and annual basis.

In addition to dynamically allocating bandwidth for programming categories, the Operations Center 202 can also dynamically change the menu capacities in order to accommodate the change in programming and bandwidth. For example, on a Saturday afternoon in October 240, the major menu for sports may include a separate subcategory for college football. This subcategory would, in turn, have a separate submenu with a listing of four, six, eight, or more college football games available for viewing. In order to accommodate this dynamic menu change, the Operations Center 202 must add a submenu listing to the major sports menu,

create a new or temporary submenu for college football, and allocate the necessary menu space on the college football submenu.

Once the television programs have been packaged and a program control information signal is generated to describe the various categories and programs available, the packaged programs are then digitized, compressed, and combined with the program control information signal. Upon the signal's departure from the Operations Center 202 the breakdown into categories is insignificant and the signal is treated like any other digitally compressed signal.

Figure 4a shows the basic operations that must occur in order for the packaged signal to be sent to the satellite 206. External digital and analog signals must be received from television programming sources and converted to a standard digital format 242, defined above for the computer assisted packaging equipment (CAP) 246. Also within the Operations Center 202, stored programs 244 must be accessed using banks of looping tape machines or other video storage/retrieval devices, either analog or digital, and converted to a standard digital format 242 prior to use by the CAP 246.

The programmer/packager utilizing the CAP 246 must input a variety of information in order to allow the CAP 246 to perform its function of generating program control information and packaging programs. Some of the information required by the CAP 246 are the date, time slots and program categories desired by the television programmer.

The CAP 246 system includes one or more CPUs and one or more programmer/packager consoles. In the preferred embodiment, each packager console includes one or more CRT screens, a keyboard, a mouse (or cursor movement), and standard video editing equipment. In large Operations Centers 202s multiple packager consoles may be needed for the CAP 246.

As shown in Figure 4b, the first step in the operation of the CAP 246 is selecting the type of programming 248 which will be packaged. Basically there are 6 broad categories in which most television programming can be classified: static programming 250, interactive services 252, pay per view 254, live sports specials 256, mini pays 258, and data services. Static programs are programs which will show repetitively over a period of time such as a day or week. Static programs include movies showing repetitively on movie channels, children's programs, documentaries, news, entertainment.

Interactive services includes interactive programs using the Vertical Blanking Interval (VBI) or other data streams synchronized with the programming to communicate interactive features (such as those used in education), and games. Pay per view are programs which are individually ordered by the subscriber. After ordering, the subscriber is authorized to access the program for a limited time, (e.g. three hours, two days, etc.). Live sports specials are live events usually related to sports which subscribers are unlikely to watch on taped delay.

Mini pays are channels to which each set top box may subscribe. The subscriptions for mini pays 258 may be daily, weekly, or monthly. An example

would be the Science Fiction channel. Data services are services in which information is interactively presented to the subscriber using a modem or other high rate of speed data transfer. Some examples are Prodigy, services for airline reservations, and TV guide services (e.g. TV Guide X*PRESS™, InSight™, etc.). Data could also include classified or other forms of advertising.

After selecting the type of programming, the packager must identify a pool of programs (within the category) to be packaged. The next CAP 246 step varies for different program categories. For the category of live sports, additional program interstitial elements 262 may be added such as promos and other sports news before further processing. For the live sports, static, interactive services 252 and pay per view 254 categories the following CAP 246 step is for one television program to be selected 264. This is followed by each program individually being assigned dates to be played or a start date (for continuous play) and start times 266. Many dates and start times may be assigned to any given program. The program information for these categories may then be processed for allocation of transponder space and setting of prices.

Mini pays and data services require less processing by the CAP 246. After identifying the mini pays 258, the CAP 246 may proceed to allocation of transponder space and pricing for the mini pays 258. Data services in the preferred embodiment generally do not require allocation of transponder space and generally do not require price setting. The information for data services 260 may be directly

processed for menu configuration. In alternate embodiments the data services 260 may be processed through these portions of the CAP 246 program.

The CAP 246 then uses an interactive algorithm to allocate transponder space 268 and set prices 270. The factors weighed by the algorithm are: 1. buy rates of the program, 2. margin of profit on the program, 3. length of the program, 4. any contractual requirement which overrides other factors (such as requirement to run a specific football game live in its entirety). The information on buy rates of the program may be obtained from the Central Statistical and Billing Site or a Regional Statistical and Billing Site as will be described later. The CAP 246 must consider the priority levels of programming when allocating transponder space. Particularly, as in the preferred embodiment, transponders are assigned to three specific priority levels.

Following transponder allocation and price setting, the CAP 246 proceeds to menu configuration 272. The positioning of programs within the menu configuration 272 can have an effect on subscriber buy rates for the program. Therefore, an algorithm accounting for either a manually assigned program importance, or a calculated weight of the program importance, is used to determine each programs position within the menu scheme. For instance, a popular program with a high profit margin may be assigned a high weight of importance and shown in a prominent place in the menu scheme. Alternatively, a high profit program with sagging sales may be manually assigned a prominent place in the program schedule to increase sales.

After a series of entries by the programmer/packager at the Operations Center 202, the CAP 246 displays draft menus or schedules (including priority levels) for programming. The packager may now manipulate the menus and schedules and make changes as he feels necessary. After each change, the packager may again display the menus or schedules and determine if any more changes are necessary. When the packager is satisfied with the menu configuration 272 and scheduling of television programs, he may then instruct the CAP 246 to complete the process.

After menu configuration 272, the CAP 246 may begin the process of generating a program control information signal 274. In order to generate program control information signals which are specific to a particular cable headend 208 system, the CAP 246 incorporates cable franchise configuration information 276. In the preferred embodiment, basic cable franchise configuration information 276 is stored at the Operations Center 202. The cable franchises upload changes to their specific franchise information from time to time to the Operations Center 202 for storage. Preferably a separate CPU handles the management of the cable franchise information. From the stored cable franchise information, the CAP 246 generates a cable franchise control information signal which is unique to each franchise.

Using the unique cable franchise control information signals 278 and the menu configuration 272 information, the CAP 246 generates the program control information signal 274. The program control information that is unique to a particular cable franchise may be identified in various ways such as with a header. With the header identification, the cable headend 208 may extract the portions of the

program control information signal which it needs. Now, the CAP 246 may complete its process by electronically packaging the programs into groupings 280 for the signal transmission and adding the program control information to the packaged programs 282 to form a single signal for transmission. Through manual entries by the packager or by comparing against a list of programs, the CAP 246 will determine whether the programs are arriving from external sources 204 or sources internal to the Operations Center 202.

Upon completion of the CAP's functions, the Operations Center 202 or the uplink site compresses 284, multiplexes 286, amplifies 288 and modulates 290 the signal for satellite transmission 292. In a basic embodiment, the CAP 246 will also allow entry of time slots for local avails where no national programming will occur.

Figure 5 is a more detailed flow chart of some of the functions performed by the CAP 246 after an initial program schedule has been entered and menu configurations generated. The flow chart 300 shows six basic functions that are performed by the CAP 246: (1) editing program schedule for local availability 304 (only for non-standard services, i.e. those services that are not national cable services); (2) generating program control information signals 307; (3) processing external programs 310; (4) processing internal programs 320; (5) processing live feeds 330; and, (6) packaging of program information 340. In an alternate embodiment, the CAP 246 is capable of incorporating local programs and accommodating local availability for local television stations.

Following completion of the programming scheduling (accounting for local availability if necessary) and menu generation 304, the CAP 246 may perform three tasks simultaneously, generating program information signals 307, processing external programs 310 and processing internal programs 320.

The CAP 246 automatically identifies external programs needed 312 and identifies which external feed to request the external program 314. The CAP 246 gathers and receives the external programming information and converts it to a standard digital format 316 for use. The CAP 246 also identifies internal programs 322, accesses the internal programs 324, and converts them to a standard digital format if necessary 326. In addition, the CAP 246 identifies live signal feeds 333 that will be necessary to complete the packaged programming signal 336. In its final task, the CAP 246 completes the packaging of the programs, combines the packaged program signal with the program control information signal, amplifies the signal and sends it out for further processing prior to uplink.

In the preferred embodiment, the Operations Center 202 and uplink or master control site are collocated. However, the Operations Center 202 and uplink site may be located in different geographical places. Also, functions and equipment within the Operations Center 202 may be remotely located. For instance, the program storage may be at a different site and the programs may be sent to the CAP 246 via landline.

In alternate embodiments using multiple Operations Centers, it is preferred that one Operation Center be designated the Master Operations Center and

all other Operations Centers be Slave Operations Centers. The Master Operations Center performs the functions of managing and coordinating the Slave Operations Centers. Depending on the method in which the Slave Operations Centers share functions, the Master Operations Center coordination function may involve synchronization of simultaneous transmissions from multiple Slave Operations Centers. To perform its functions, the Master Operations Center may include a system clock for synchronization.

An efficient method of dividing tasks among Operations Centers is to assign specific satellite transponders to each Operations Center 202 and to assign external program sources 204 to the nearest Operations Center. Of course this division of resources may not always be possible. Since programming will be grouped into priority levels with each priority level likely to be assigned specific satellite transponders, it is also possible to assign each Operations Center to a priority level. For example, in a three priority level system with two Slave Operations Centers and 18 transponders, the Master Operations Center may be assigned priority level 1 and assigned 9 transponders. Slave Operations Center A may be assigned priority level 2 and 5 transponders, while Slave Operations Center B is assigned priority level 3 and 4 transponders. In a multiple Operations Center configuration dynamic bandwidth allocation and dynamic menu capacity allocation become more complex and must be coordinated by the Master Operations Center.

Similar to multiple Operations Centers, a delivery system may have multiple satellite uplinks. Preferably each Operations Center has one or more

uplink sites. Each Operations Center controls the functions of its assigned uplink sites and may assign one site as a master uplink site.

The program control information signal generated by the Operations Center provides data on the scheduling and description of programs to the network controller 214 or in an alternate configuration directly to the set top terminal 220 for display to the subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). This configuration is required to accommodate differences in individual cable systems and possible differences in set top terminal devices. The set top terminal 220 integrates either the program control signal or the set top terminal control information stream together with data stored in the memory of the set top terminal 220, to generate on-screen displays for assisting the subscriber in choosing the programs he wishes to view. (Throughout the description the term "program control information" is being used to indicate control information coming from the cable headend 208 to the set top terminal 220, whether it is sent directly from the Operations Center, processed by the Network controller 214 and then forwarded to the set top box (STTCIS), or transmitted over telephone lines.)

The types of information that can be sent via the program control signal include: number of program categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times, length of

programs, description of programs, menu assignment for each program, pricing, whether there is a sample video clip for advertisement for the program, and any other program, menu or product information.

The goal of the menu driven program selection system is to allow the subscriber to choose a program by touring through a series of menus utilizing a remote control for cursor movement. The final choice in the series of menus will identify one particular channel and one time for activation of that channel. Armed with a channel and activation time the set top terminal 220 can display the selected program on the television for the viewer. To achieve this goal a simple embodiment assigns an intelligent alpha-numeric code to each program. This alpha-numeric code identifies the category of the program, the menu in which the program should be displayed, its transmission time(s), and the position on the menu that the program should be displayed.

In this simple embodiment, the program control information, including these menu codes, is sent continuously from the Operations Center to the network controller 214, and ultimately to the set top terminal 220. For example, four hours worth of programming information can be sent via the program control information signal continuously in the format shown in Figure 6.

Figure 6 shows the basic information that is needed by the set top terminal 220. The program descriptions shown are coded abbreviations. For example, C for comedy, N for news, S for sports, A for cartoons, and TX for text. If there is a textual description for a program, such as a movie, the description may be

given following that program's coded description or may be communicated following the four hours' worth of programming information. As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code informs the set top terminal 220 of whether there is still or live video available to advertise the program.

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, 01/01/94, represent the date. The following four characters, 1600 represent the start time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00PM on New Years day 1994.

In the 12:30 Channel 1 entry of Figure 6, two menu codes are shown. By allowing two menu codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal amount of information being communicated to the set top terminal 220 on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after his menu selection.

The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced in many different ways. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set-top terminal. This method allows the program control signal to carry less information but has the least flexibility since the menu formats can not be changed without physically swapping the ROM holding the menu format information. In the preferred embodiment, the menu format information is stored at the set top terminal 220 in temporary memory either in a RAM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated via the program control information signal. New menu format information would be sent via the program control information signal or the STTCIS to the set top terminals each time there was a change to a menu.

In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the cost of the set top terminal 220 low and limits the bandwidth necessary for the program control information. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information.

As will be described later, live video signals may be used in windows of certain menus. These video signals can be sent via the program control

information signal, STTCIS, or can be taken off channels being transmitted simultaneously with the menu display. If the video signal is taken off a channel, less information needs to be sent via the program control information signal. However, this technique requires that separate decompression hardware be used for the program control information and the channel carrying the video. Separate decompressors for the video signals and program information signal allows for the greatest flexibility in the system and is therefore the preferred embodiment. A separate decompressor also assists in assuring that the switch from menus to television programming is smooth and without any significant time delay.

Live video for menus, promos or demos may be sent to the set top terminal 220 in several ways: a) on a dedicated channel, b) on a regular program channel and scaled to size, c) sent along with the program control information signal, etc. However, in the preferred embodiment, a great deal of short promos or demo video are sent using a split screen technique on a dedicated channel.

Using a split screen technique, any number of different video clips may be sent (e.g. 2,4,6,8). To show the video clip on a menu, the video must either be scaled and redirected to a video window on a menu screen or a masking methodology can be used. Masking involves playing the entire channel of video (all 2,4,6, or 8 split screens) in background and masking the unwanted video clip portions of the split screen by playing the menu in foreground and overlaying the unwanted background video. Masking is the least expensive method because it does not require any special hardware and it increases video throughput to the set top

terminal 220. However, using the masking technique without any video redirecting causes each video clip to be located in a different position on the screen. It also requires the masking to be different for each video clip and makes consistent format difficult. Scaling and redirecting video is generally difficult, expensive and requires additional hardware.

In order to limit the amount of bandwidth needed to transmit the program control information signal, various compression techniques employed for non-video may be used such as block coding, contour coding, blob encoding, and run-length encoding. Further, the program control information signal may be divided into text and graphics, or video, text and graphics and then recombined at the set top terminal 220 using a text generator, graphics decompression, and video decompression as necessary.

Figure 7a shows a basic block diagram of a digital compression set top terminal 220. In some respects, the set top terminal 220 is similar to other converter boxes currently available and can include a variety of error detection, decryption 600 and coding techniques such as anti-taping encoding. The set-top terminal must also have a tuner 603, digital demodulator 606, and demultiplexers 609, 616 as well as audio equipment 612, 614. Also shown in Figure 7a is a remote control interface 626 for receiving and processing signals from remote control unit 900. A modem 627 is provided for allowing communication between a microprocessor 602 and the cable head end. NTSC encoder 625 provides an NTSC video output to be output as a standard television signal.

The microprocessor 602 is capable of executing program instructions stored in memory. These instructions allow a user to access various menus by making selections on the remote control 900. The various program instructions for accessing menus and performing other functions are described below.

The manner in which the video is decompressed and the menus are generated from the program control signal or STTCIS varies depending on the specific embodiment of the invention. However, at a minimum, one video decompressor capable of decompressing one video signal must be used. Basic menu format information may be stored in a graphics memory comprising ROM, non-volatile RAM, EPROM, and/or EEPROM 620. Video decompressors 618 and 622 may be used if the video is compressed, and additional equipment to generate menus may be included. In one embodiment, a separate decompressor 622 is used to process the program control information signal and a video combiner 624 incorporates video and menu graphic information. In the preferred embodiment, the program signal is sent with three primary parts, compressed video (or video location information), compressed graphics, and text. After the program signal is demultiplexed into its component parts, a video decompressor, a graphic decompressor, a text generator and a combiner are used to assist in creating the menus.

Figure 7b shows a basic block diagram of an alternative digital compression set top terminal 220. The same components shown in Figure 7a are repeated in Figure 7b, and given the same reference number (e.g., tuner 603, modem

617, NTSC encoder 625, etc.). Figure 7b also shows the addition of a smart card interface 617 to allow additional features to be included on a smart card insertable into the smart card interface 617. Error correction circuitry 607 is also shown receiving the demodulated signal, prior to demultiplexing the signal. Memory associated with the microprocessor 602, the demultiplexer 609, the decryptor 600, and the video decompressor 618 is shown in Figure 7b.

Box 700 in Figure 7b shows the elements of an upgrade module which is described below with respect to Figures 9a and 9b. The remaining circuitry in Figure 7b shows a basic decompression box 720, also described below.

The circuitry in box 700 includes a video, graphics and text demultiplexer 616, a text and graphics video plane combiner 624, a graphic decompressor 622 and a graphics memory 620. Graphics in memory 620 is preferably run-length compressed, however other methods of compressing graphics may be used as is known by those skilled in the art.

The generated menus and video are combined in the combiner 624 and output to an anti-taping encoder 619. Any method of anti-tapping encoding known by those skilled in the art may be used with the present invention.

Figures 8a and 8b show front and back views respectively for the preferred embodiment of the set top terminal 220. The front panel of the set top terminal 220 as shown in Figure 8a includes an infrared sensor 630 and a series of LED displays 640. These LED displays 640 preferably indicate with an icon or a letter (e.g. A-K) the major menu currently selected by the set top terminal 220. This visual

display will remain lit while the subscriber is watching (or listening to) programming within a major menu. The LEDs 640 of the preferred embodiment also show the channels selected directly by a user, or menu channel selections which range from 1 to 50.

LEDs 640 are preferably provided to indicate a decompression error, a processing error, or other error. Text messages may alternatively be provided to more clearly indicate particular errors to servicemen or subscribers. These error indications aid in repairing or correcting any such errors in the set top terminal 220 or assist in programming the set top terminal 220. Further displays may include current channel, time, volume level, sleep time, parental lock (security), account balance, use of a hardware upgrade, second channel being recorded by VCR, use of the Level D music hardware upgrade in a separate room, and any other displays useful to a subscriber to indicate the current status of the set top terminal 220.

The LED's 640 may also provide an indication of the digital audio channel currently tuned. With this display feature, subscribers may use the digital audio feature without activating the television screen. The source of a signal and output selected (e.g., a subscriber's separate audio system, a VCR, etc.) may be displayed. Although LED's are preferred, the set top terminal 220 may also use a CRT, LCD's, or other display technology.

On the right front half of the set top terminal 220 there is a flapped opening 635 into a cavity that allows the insertion of a magnetic cartridge (or similar portable storage device, including optical disk, ROM, EPROM, etc.). This cartridge

opening 635 allows the set top terminal 220 to be upgraded or reprogrammed locally with the use of a magnetic tape cartridge. Game cartridges may also be accepted through a similar flapped opening allowing the subscriber to play video games using the set top terminal 220.

On the top or cover of the set top terminal 220 are located pushbutton controls 645. In the preferred embodiment these pushbutton controls 645 duplicate the two-part alpha-iconic remote control that will be described later. Any function that can be performed on the remote may also be performed at the set top terminal 220 using the duplicative pushbutton controls 645.

Figure 8b provides a rear view of one embodiment of the set top terminal 220 including the input/output equipment of the terminal. Moving from left to right there are a pair of output terminals 650, a pair of input terminals 652, a pair of stereo/audio output terminals 654, a satellite dish input port 656, a telephone jack 658 and an RS422 port 660. Further to the right there is an upgrade port 662 and a cover plate 664 held in place by a series of sheet metal screws.

The set top terminal 220 has two outputs 650, one for a television and one for a VCR. Control signals may be transmitted through the VCR output to allow the VCR to be automatically controlled by the set top terminal 220. Certain program may be selected by a subscriber from menus, and the VCR will be automatically activated to record the selected program.

The set top terminal 220 is equipped to handle one or two cable inputs by way of inputs 652 for incoming signals. In addition, a phone jack 658 and RS242

or 422 port 660 are provided for maintenance, trouble shooting, reprogramming and additional customer features. In alternate embodiments, the telephone jack 658 may be used as the primary mode of communication between the cable headend 208 and the set top terminal 220. This connection is possible through the local telephone companies, cellular telephone companies or personal communications networks (PCN).

In an alternative configuration, in areas without cable services where subscribers use backyard satellite systems (TV RO) to receive packaged television services, the set top terminal 220 will include the appropriate hardware to allow connection to the satellite 206 reception equipment through port 656. In this configuration, the menu system within the set top terminal 220 will be programmed directly from the operations center. Additionally, an upstream communication mechanism must be in place at the subscriber's home (i.e. modem) to communicate information to the operations center.

In order to provide the greatest flexibility possible and prevent the set top terminal 220 from becoming outdated during the terminal's useful life, an additional electronic card slot or expansion slot has been built into the preferred embodiment. This expansion slot is covered by the metal plate cover 664 shown in Figure 8b. It is anticipated that additional memory or capabilities may be needed for certain customer features and also to update the system as the cable delivery system's capabilities increase. The expansion slot provides an easy method to upgrade the terminal hardware.

In the preferred embodiment, the set top terminal 220 includes a hardware upgrade port 662 as shown in Figure 8b, in addition to the expansion slots behind plate 664. The hardware upgrade port 662 should accommodate at least a four-wire connection for: (1) error corrected, decrypted data output of the set top terminal 220, (2) control interface, (3) decompressed video output of set top terminal 220, and (4) video input port. In the preferred embodiment multiple wires are used to perform each of the four functions. The four sets of wires are combined in a single cable with a single multipin connector. Port 662 may also be used to attach various hardware upgrades below to a set top terminal 220.

In the preferred embodiment, multipin connections may be used for the multiwire cable. The multipin connection 662 may range from DB9 to DB25. A SCSI, or small computer systems interface, port may also be provided. Alternatively, four or more ports may be provided instead of the single port depicted.

The preferred embodiment has four hardware upgrades available for a set top terminal 220: a Level B interactive unit, a Level C interactive unit with compact disc capability, a Level D digital radio tuner for separate room use, and a Level E information download unit. Each of these upgrades is connected to the set top terminal 220 unit via the same upgrade port 662 described earlier. The same four wires in a single cable described earlier may be used.

The Level B interactive unit will allow the user access to online data base services for applications such as home shopping, airline reservations, news,

financial services, classified advertising, home banking, and interactive teletext services. For example, with this upgrade, a user will be able to reserve plane tickets or buy consumer electronics. The primary feature of this upgrade unit is that it allows actual transactions to occur requiring two way communications via modem with outside services. This added two way communications capability may be with the cable headend 208. Additionally, this two way communications may occur over cellular or PCN.

The Level C interactive unit will employ a high volume local storage capacity, including compact disc or other random access digital data formats. This unit will allow use of interactive multi-media applications. For example, computer games, multi-media educational software, encyclopedias, other reference volumes (e.g. Shakespeare library), etc. In the preferred embodiment, many of these applications will interact with live programming providing additional information and interactivity to the basic program feed. For example, a viewer watching a show set in a foreign country may be able to retrieve additional information, maps, economic data, etc. about that country that are stored on the compact disc. In the level C applications, the upgrade hardware may closely monitor the television broadcast via additional data channels (e.g. vertical blanking interval, or other digital data encoded within live video) providing context sensitive interactivity.

The Level D hardware upgrade, digital radio tuner, will allow the subscriber separate access to the digital radio channels while other programming (not necessarily radio) is being viewed on the television. Typically this upgrade

would be used for digital radio usage in a separate room from that of the television. The upgrade has a separate tuner, decompressor, and visual display. In the preferred embodiment a second remote control (scaled down version) is provided to access the audio system.

The Level E hardware upgrade allows the subscriber to download large volumes of information from the operations center or cable headend 208. The Level E hardware upgrade will enable subscribers to download data such as books to local storage. Primarily the Level E hardware upgrade is additional local storage via hard disk, floppy, optical disk, magnetic cartridge etc. Preferably a small portable reader called "EveryBook™" is also provided with the upgrade to enable downloaded text to be read without the use of a TV.

The downloadable information may be text or video supplied by the operations center or cable headend 208. With this upgrade, books may be downloaded and read anywhere with the portable reader. Using this upgrade video may be downloaded and stored in compressed form for later decompression. The video would be decompressed only at the time of viewing. Important text that the public desires immediate access may made available through this system. Text such as the President's speech, a new law, or a recent abortion decision rendered by the Supreme Court may be made immediately available.

Using a more sophisticated port, especially the SCSI port, multiple hardware upgrade units may be connected, or "daisy-chained" together, to operate simultaneously.

Figure 9a shows sets of wires in a single cable connecting an upgrade module 700 and the simple decompression box 720 through a port similar to the hardware upgrade port 662. The simple decompression box 720 preferably is an industry standard decompression box capable of communicating with an upgrade module to enhance functionality. For example, a microprocessor in the simple decompression box 720 will be able to communicate with a microprocessor in an upgrade module 700.

Thus, as shown in Figure 9a, if this type of connection is built into a simple decompression box that does not have the full functionality of the set top terminal 220, an upgrade module unit 700 may be connected providing the simple decompression box 720 with the full functionality of a set top terminal 220. Subscribers who have purchased simple decompression boxes 720 may be given all the functions of a set top terminal 220 inexpensively.

In the preferred embodiment, multipin connections may be used for a multiwire cable connecting decompression box 720 with the upgrade module 700. The multipin connection may range from DB9 to DB25. A SCSI, or small computer systems interface, port may also be provided. Alternatively, four or more ports may be provided instead of the single port depicted.

The digital data set of output wires of the simple decompression box 720 will preferably output error corrected and decrypted data to the upgrade set top terminal 700. The second set of wires, the interface connection, allows the microprocessor in the upgrade module 700 to communicate to the microprocessor of

the simple decompression box 720. In this manner, the video circuitry of the upgrade module 700 and the simple decompression box 720 may be synchronized. The third set of wires, the decompressed video output, can provide the upgrade module 700 with a decompressed video signal to manipulate. The fourth set of wires, video input set, allows the simple decompression box 720 to accept a video signal that is a combined text, graphics, and video signal.

Upgrade module 700 preferably includes at least the following circuitry: a video, graphics and text demultiplexer; a text and graphics video plane combiner; a run-length graphics decompressor; and, a run-length compressed graphics memory (non- volatile RAM, ROM, EPROM, or EEPROM). By means of communications through the multi wire connection between upgrade modules 700 and simple decompression box 720, compressed video and control signals may be demultiplexed by the demultiplexer within upgrade module 700. The run-length graphics decompressor, by communicating with the run-length compressed graphics RAM, permits decompression of the input compressed video signal. The text and graphics video plane combiner in upgrade module 700 allows the demultiplexed and decompressed signal to be output, through simple decompression box 720, to a subscriber's television with both video and overlay menus with text.

Figure 9a shows the CATV input 722, the video input 724, and the video and audio outputs 726, 728, as part of simple decompression box 720. This is the preferred embodiment because this will reduce the component cost of upgrade module 700. Upgrade module 700 could simply be a cartridge insertable into simple

decompression box 720. Alternatively, as shown in Figure 9b, the CATV input 722, the video input 724 and the video and audio outputs 726, 728 may be included as part of upgrade module 700.

The electronics of the set top terminal 220 must receive signals from the Cable headend 208 or Operations Center and separate the program control information from the packaged programs. After separation of the program control information, this signal may be used to generate program menus allowing the user to select specific television programs from within the packaged programs. After selection of a particular program, the set top terminal 220 will demultiplex and extract a single channel signal then decompress the appropriate channel signal to allow the user to watch his selected program. Although the set top terminal 220 can be equipped to decompress all the program signals, this adds unnecessary cost since the subscriber will view one channel at a time. Upon the occurrence of an error in this selection and decompression procedure, the set top terminal 220 LED display will warn the subscriber of an error.

During the normal functioning of the set top terminal 220 the LED display can be customized by the user to display the time, the program channel, VCR activation or other pertinent information. Although the set top terminals may be operated using the keyboards located on top of the set top terminal 220 box, it is expected that most subscribers will use the remote control.

Although the preferred embodiment decompresses one channel at a time for the viewer, users who desire to use the picture-on-picture capability of their

televisions can be provided with an upgrade to the set top terminal 220 allowing two channels to be tuned and decompressed at any given time. Once two signals are available to the television the picture-on-picture capability may be utilized to its fullest potential. With the picture-on-picture capability available in the set top terminal 220, a special television is not required for picture-on-picture functionality.

In the preferred embodiment all of the customer features available on the set top terminal 220 will be controllable via on-screen menu displays. In this manner, the subscriber using a cursor may easily customize the programming of his set top terminal 220. The basic programming of each set top terminal 220 will be located on ROM within the set top terminal 220. Random access memory, the magnetic cartridge capability, and the extension card slot will each allow upgrades and changes to be easily made to the set top terminal 220.

In the preferred embodiment, the set top terminal 220 will include features that are now being adopted in the industry such as parental controls and locks, electronic diagnostics and error detection, mute, on-screen volume control, sleep timer, recall of last selection, etc. Each of these features has a corresponding menu that allows on-screen customizing and activation of the feature. The set top terminal 220 also includes a sophisticated favorite channel list and favorite program list.

In addition to all the features that the set top terminals supports with its current internal programming, additional features may be added or existing features upgraded through remote reprogramming of the set top terminal 220.

Utilizing the resident operating system on the ROM, the cable head end is able to reprogram the random access memory of the set top terminal 220. With this capability the cable head end can remotely upgrade software on the set top terminals.

In the preferred embodiment, the cable head end will reprogram the menu format from time to time based upon special events or programming needs, such as Olympic telecasts, presidential elections, etc. This reprogramming will occur by using the program control information channel and sending the appropriate signals over this channel. In an alternative embodiment, one channel is dedicated for the special programming needs. When reprogramming is to occur, the cable head end will send an interruption sequence on the program control information channel that informs the set top terminal 220 that reprogramming information is to follow. Significant reprogramming of the set top terminals will occur infrequently. However, the changing of color or formats on menus occur more often. In alternative embodiments, color changes to menus may be accomplished via the program control information itself and does not require reprogramming from the cable head end.

In the preferred embodiment, the basic building blocks or templates of the on-screen menu displays will be stored on graphics memory consisting of no-volatile RAM, ROM, EPROM, or preferably, EEPROM, as shown as 620 in Figure 10. With the information from this graphics memory 620, the microprocessor 602, graphics decompressor 622, text generator 621 (if necessary), and video combiner 624 will build a menu screen. The memory files of the graphics memory or EEPROM

620 are preferably categorized into three categories, background graphics 800, logo graphics 820, and menu and display graphics 850.

A background graphics file 800 will store menu backgrounds such as: universal main menu backgrounds 804, universal submenu backgrounds 808, promo backgrounds 812 and custom menu formats 816. A logo graphics file 820 will store any necessary logos such as: Your Choice TV logos 824, Network logo files 828, cable system logo files 832, studio logo files 836, and graphic elements file 840. A menu display and cursor graphics file 850 will store menu display blocks 854 and cursor highlight overlays 858 as well as any other miscellaneous files needed to build the menus.

Using this method of storing menus, the menus can be changed by reprogramming the graphics memory 620 of the set top terminal 220. To revise the entire design of displayed menus, the network controller 214 or operations center instructs the EEPROM 620 to be erased and reprogrammed with new menu templates. To change one menu format or logo, the network controller 214 or operations center instructs just the one location in memory to be erased and rewritten. Obviously, this menu reprogramming can be done locally (at the set top terminal 220) by a servicemen.

As shown in Figure 10a, each memory subfile is further divided into various memory blocks. For example, the background graphics file 800 contains the universal main menu backgrounds 804. The universal main menu backgrounds memory 804 includes memory units UM1, UM2 and UM3, as shown in Figure 10a.

Similarly, the logo graphics file 820 and menu display and curser graphics file 850 further contain within those subfile individual memory blocks (for example, studio logo file 836 has memory block SL1; menu display blocks 854 has memory menu display block MD1).

Figure 10b shows the hierarchical storage of text transmitted from the cable head end as STTSCIS. Although text may be continuously transmitted with the video signals to set top terminals 220, text may also be transmitted intermittently. In such a case, the text is stored in the set top terminal. Preferably, the text is transmitted and stored in a compressed format using known techniques. Additionally, the text is preferably stored in graphic memory 620 within set top terminal 220.

Depending upon the use of the text, it will be stored in one of three portions of memory. Information sent with the text will either direct the text to a particular portion of memory, or include information as to the priority of text. The microprocessor 602 may then direct the text to the appropriate memory location for storage.

If the text is to be used frequently and over a long period of time, a long term storage 875 will be used. If the text will be used for a shorter period of time (for example, a month), the text will be directed to an intermediate storage area 877. If the text is to be used almost immediately, or for a short period of time (for example, within a few days) the text is directed to a short term storage area 879. Microprocessor 602 locates the appropriate text required for a particular menu and

retrieves it from the appropriate portion of memory 620. The text is output from the graphics memory 620 to the text generator 621. Text generated from the text generator 621 is thereafter directed to text/graphics combiner 624.

Figure 10c shows the steps performed by the microprocessor 602 for creating a menu based upon a series of overlay screens. These instructions are stored in memory within the set top terminal 220. Alternatively, these instructions or routines are transmitted from the operations center 202 to be stored in memory within the individual set top terminals 220.

Initially, microprocessor 602 instructs tuner 603 to select a channel. The channel is decompressed, and error corrected and decrypted, if necessary. If the video is to be reduced in size, so as to be placed within a video window 1556, or is a split screen video window which must be enlarged, the video is scaled to the appropriate size. Additionally, the video may be required to be redirected to a portion of the television screen. This is done by creating a series of offsets for each pixel location of the video.

Graphics must also be used to create a menu in most instances. As is shown in block 882, the microprocessor 602 must fetch a background file, fetch a logo file and fetch a menu display and cursor file in most instances. Each of these files must be decompressed. Following decompression, the file is sent to video combiner 886.

Similarly, microprocessor 602 must fetch text, as shown in block 884. Depending upon the memory location of the text, microprocessor 602 will fetch the

text for long-term, intermediate-term, or short-term storage, as described above. Based upon this memory retrieval, the text is generated and sent to video combiner 886. Video combiner 886 combines the video (if any) with as many screens of a decompressed graphics as are necessary, and any text. The image or portions of the image are stored in combiner 886 until all overlays are received by combiner 886. Thereafter, the entire image is sent, under direction of another routine, to be displayed on the television screen, as represented by display block 888.

Figure 10d is a full chart of programming instructions performed by microprocessor 602 for sequencing menus. Upon powerup of the set top terminal 220, start up routine 890 is performed. Any error checking is thereafter performed (891), and introductory menu subroutine 892 is performed. This subroutine displays the introductory menu and the microprocessor thereafter awaits for an input 893.

If the subscriber inputs a channel selection 894, video for the particular channel is decompressed 895. Otherwise, the microprocessor performs another routine 896 to display the home menu 897.

At the home menu portion of the sequence of routines, a subscriber may select one of the major menus, thus starting the sequence of displays represented by routine block 898. Alternatively, a subscriber may go directly to a major menu by depressing a menu select button on remote 900 and the microprocessor will execute another the go to submenu subroutine 896.

Once a subscriber has selected a major menu, the appropriate subroutines are executed by the microprocessor using a series of instructions shown

in block 898. After each display, microprocessor 602 awaits for a selection by the subscriber, shown as block 899. These blocks could be also represented as decision blocks.

After displaying the major menu, and receiving a selection by the user, a particular submenu for a subcategory is displayed, if such a menu exists. Again, microprocessor 602 waits for an input from the subscriber after executing a routine to display a program listing submenu. Thereafter, after receiving an input, microprocessor 602 performs the next routine for displaying a program description submenu. Thereafter, if a particular selection requires a confirmation menu, that subroutine is executed and the appropriate menu displayed. Thereafter, the selected video is decompressed, and displayed on the television screen. If there are any display overlay menus or hidden menus, the proper subroutine is executed by microprocessor 602 and these menus are displayed.

At any time during the selection of menus in major menu block 898, the subscriber may also depress another major menu button to move into a second column of process instructions (represented by major menu 2, major menu 3, etc. columns). Thus, a subscriber may move from major menu to major menu. Additionally, a subscriber may depress a home menu button on remote 900 to return to the home menu at any time.

The various subroutines executed by microprocessor 602 allow a subscriber to navigate through the various menus of the present invention. A subscriber may sequence back through menus or return to the home menu with a

one-touch return of the home menu button on remote 900. All of these functions help to add to the system's user friendliness.

As shown in Figures 11a and 11b, a two-section remote control is shown. To reduce costs and make the set top terminal 220 as user friendly as possible, a standard television remote control 860 is augmented by adding a new section 862 that provides the additional digital menu access and ordering functions. Figure 11a depicts the addition of menu access and cursor movement control to a Gerald RC 650 Remote Control. The cursor movement and function buttons required for the set top terminal's operation may be added to any standard remote control format allowing the user to feel more at home with the new remote control. Figure 11b shows the two-section remote control combined in a single unit 864.

The remote control 864 has an ordering button 866, four-way cursor movement, and a "go" button 868, and menu access buttons 870. The remote operates using infrared with the signals being received by the infrared sensor on the front of the set top terminal 220.

In the simplest embodiment the remote may be built with only cursor movement and a go button. In more sophisticated embodiments the remote control may be provided with buttons that are programmable to perform specific functions for a series of entries. An intelligent or smart remote would increase both the cost and capability of the set top terminal 220 system. Using this augmented remote control the subscriber can navigate the program menu system of the set top terminal 220.

Figures 12a and 12b show an alternative and preferred embodiment of the remote control for use in the present invention. The standard television receiver remote control switches or buttons 920 are again separated from the menu accessing ordering function buttons 950. The standard television receiver remote control buttons 920 include volume control, channel select, power and signal source buttons. The menu buttons 950 include cursor movement and select, menu select, and pay television buttons. However, the standard buttons 920 are separated from the menu access and ordering buttons 950 in the longitudinal direction of the remote, as opposed to the width-wise separation, shown in Figure 11a. Additionally, the color of the buttons or the surrounding background may differ between the standard television remote control buttons 920 and the menu buttons 950 to visually differentiate between these two groups of buttons.

The width and depth of the remote control unit 900 are considerably less than the length to allow the remote control unit 900 to fit easily within a user's palm. The remote control unit 900 in preferably has the center of mass balanced substantially near the longitudinal middle. This allows a user's thumb to naturally be placed in substantially the middle portion of the remote control unit 900, when it is picked up by a user.

Since the center of mass of the remote control unit 900 is placed substantially near the longitudinal middle of the remote 900, thereby having a user's thumb naturally fall in this same center region, the standard remote 920 and menu access 950 switches or buttons most frequently accessed and depressed by a

user are placed within easy reach of the user's thumb. Channel and volume increment and decrement buttons 910 are placed near this center of mass and longitudinal center line. The channel buttons 910 are preferably beveled in opposing directions to allow a user to feel for and press a desired button without looking down at remote 900. Similarly, the volume buttons 910 are preferably beveled in opposing directions for the same reason.

Additionally, the channel buttons 910 could have a surface texture different from those of the volume buttons 910 to allow even easier differentiation between channel and volume buttons 910. For example, the volume buttons could have a rough surface texture, while the channel buttons could have a smooth surface texture.

Also placed in the longitudinal center, within easy reach of a user's thumb, are cursor movement buttons 970 and "go" button 975. The "go" button 975 selects an option corresponding to the placement of the cursor. As opposed to buttons, a joystick may be used with a selection on the stick, or a trackball, depressible for selecting a desired choice. The cursor buttons 970 are placed ninety degrees apart, with the "go" button 975 placed within the center of the cursor movement buttons 970, as shown in Figure 12b. The cursor movement buttons 970 are preferably beveled inwardly toward the "go" button 975. The "go" button 975 is recessed below the level of the cursor movement buttons 970 so that it is not accidentally pressed while depressing the cursor movement buttons 970. In addition to the beveling on the cursor movement buttons 970, they may also have a surface

texture to allow a user to feel for and select the appropriate button without looking down at the remote 900. Directional arrows could be raised or recessed on the surface of the cursor movement buttons 970 for this purpose.

Menu select buttons 960 are placed near buttons 970 as shown in Figure 12b. Menu select buttons 960 are preferably the largest buttons on remote 900. Menu select buttons 960 preferably have icons or other graphics imprinted on their top surface or adjacent to the corresponding button. For example, a button for the sports major menu may contain a baseball icon. The icons represent the programming available on the particular major menu selected by the menu select buttons 960. The icons may also be raised above the level of the menu select buttons to provide a textured surface. This would allow a user to select an appropriate menu button 960 by feel, without looking at the remote control unit 900. The icons would require substantial differences in texture, while still providing a meaningful graphic related to the associated menu.

As shown in Figures 12a and 12b, labels and icons are provided for the following major menus: movies, sports, children's programming, documentary/news, entertainment, magazines, programming guide, HDTV (high definition television), interactive TV, music, and an additional button for further programming. Menu select buttons 960 may also be labeled A through J for the above programs, with the last button for all additional major menus labeled K-Z.

The layout of the user select buttons for the remote 900 have been designed to allow a user to select an appropriate button without viewing the remote

by using the layout of buttons shown in Figures 12a and 12b, in conjunction with textured or beveled buttons. With this "eye-off-of-the-remote" construction, most of the frequently used buttons may be located by the sense of touch alone. However, to aid selection of an appropriate button visually, certain buttons may have different colors. For example, the menu select buttons 960 may all be of a color different from the rest of the buttons on the remote 900. Additionally, the colors should be selected to provide for easy location and identification by a user. For example, if the icons are printed in black ink, yellow menu select buttons 960 are preferred, because yellow would provide the greatest visual contrast with the black ink.

Although remote 900 is described with a variety of channel selection buttons, nearly all buttons from a standard remote control (section 920 buttons) could be eliminated. The present invention would allow a subscriber to use a remote control containing only menu select buttons and/or cursor movement and select buttons.

The power button 924 and "go" button 975 preferably have a separate color from the other buttons on the remote 900. The power button 924 is preferably a separate color because this button is used infrequently. The power button is placed out of a user's thumb's reach so it is not accidentally depressed. The power button 924 should be distinguished from the other buttons because a television viewer must locate this button first before viewing any programming. Similarly, the "go" button 975 is used often because it provides the means for a user to select options, and thus should be easily distinguished from the other buttons.

Pay television buttons 980 may also be assigned a color different from the other buttons on the remote 900. By making the pay television buttons 980 a different color, it would help a user to avoid selecting an undesired pay television program.

As used herein, "button" is contemplated to include all manner of switches or touch sensitive circuitry to activate a particular function in the remote control unit 900. Additionally, although the remote control unit 900 communicates with the set-top box by means of infrared transmission, other forms of communication are contemplated, including ultrasound, radio frequency and other electromagnetic frequency communication.

Figure 13 shows the basic structure of the program menu system. Although the term "menus" has been used above, the menus could also be seen as defining zones or categories of programming. The first series of menus, Introductory menu 1000, Home menu 1010, Major Menus 1020, and Submenus 1050 execute subscriber program selection inputs. The During program menus 1200 provide a subscriber with additional features or options after a program has been selected and shown. There are two primary types of During program menus 1200, Hidden Menus 1380 and Program Overlay Menus. Both are described in the following text and figures. The menu sequence and each menu structure has been particularly program designed using the "eye-off-the-remote" design concept. A subscriber can easily navigate through the menu system with the cursor movement and "go" buttons 970, 975. Since the subscriber never needs to take his eye off the

television screen, the cable operator is likely to have the subscriber's complete attention.

The introductory menu screen 1000 automatically appears upon power-up and initialization of the set top terminal 220. The introductory menu screen 1000 welcomes the user to the cable system and provides important announcements or messages. In addition, the introductory menu 1000 can be used to inform the subscriber if he has a personal or group message that has been sent to his set top terminal 220 by the cable headend. The subscriber may then access the personal or group message with an appropriate key entry while viewing the introductory menu 1000. Since the introductory menu 1000 must be viewed by each subscriber, it also provides an opportunity for the cable provider to run advertisements.

Following the introductory menu screen 1000 the subscriber will normally be advanced to the home menu screen 1010. The home menu 1010 is the basic menu that the subscriber will return to make his first level of viewing decisions. From the home menu 1010, the subscriber is able to access all television programming options. Some programming options may be accessed through cursor movement on the screen, others directly by a button selection on the remote control 900, or both, on-screen selection and remote control 900 direct access.

In the normal progression through the menu screens, the subscriber will be forwarded to a major menu screen 1020 that correlates to his direct remote control 900 selection or selection from the home menu screen 1010. The selections on the home menu 1010 are for large categories of programming options and

therefore the major menu 1020 allows the subscriber to further refine his search for the television program of his choice.

Following the major menu 1020 the subscriber will navigate through one or more submenu screens 1050 from which he will choose one particular program for viewing. For most programming selections the user will proceed from the home menu 1010 to a major menu 1020 and then to one or more submenus 1050. However, for certain programming options or functions of the set top terminal 220 the user may skip one or more menus in the sequence. For example, in the preferred embodiment the subscriber may directly access a major menu 1020 by pressing a single icon button. In an alternative embodiment, the introductory menu 1000 will provide the user with the capability of directly accessing information on his cable television account without proceeding through a series of menus.

The series of menus shown in Figure 13 is the normal or standard format for a variety of alternative embodiments to the present invention. An introductory screen upon power up that contains important messages, followed by a home menu 1010 with major programming categories is the basis upon which many alternative embodiments of the menu driven selection process can be built.

Skipping a sequence or level of the menu structure is possible and perhaps desired in certain instances. In simple alternate embodiments it is possible to combine the home menu 1010 and introductory menu 1000 into one menu that performs both functions. It will be obvious to one skilled in the art that the specific

functions of the Home menu 1010 and Introductory menu 1000 may be exchanged or shared in a number of ways. It is also possible to allow a user to skip directly from the introductory menu 1000 to a submenu 1050. This can be accomplished most easily with a separate direct access remote control 900 button. Generally, a subscriber will access a television program through execution of a submenu 1050.

The During program menus 1200 are enacted by the set top terminal 220 only after the subscriber has selected a television program. These menus provide the subscriber with additional functionality and/or additional information while he is viewing a selected program. The During program menus 1200 sequence can be further subdivided into at least two types of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor. The Hidden Menus 1380 do not effect the selected program audio. The microprocessor awaits a button entry either from the remote 900 or set top terminal 220 buttons before executing or displaying any Hidden Menu options. The Hidden Menus 1380 provide the subscriber with additional functions such as entering an interactive mode or escaping from a selected program.

Program Overlay Menus 1390 are similar to Hidden Menus 1380 in that they occur during a program. However, the Program Overlay Menus 1390 are overlayed onto portions of the television screen and not hidden. The Program Overlay Menus 1390 allow the subscriber to continue to watch the selected

television program with audio but place additional information on portions of the television screen. Most overlays cover small portions of the screen allowing the subscriber to continue to comfortably view his program selection. Other Overlays which are by their nature more important than the program being viewed will overlay onto greater portions of the screen. In the preferred embodiment, some Program Overlay Menus 1390 reduce or scale down the entire programs video screen and redirect the video to a portion of the screen.

All menu entries may be made either from buttons available on the top cover of the set top terminal 220 or from the remote 900.

Figure 14a shows the preferred embodiment for subscriber selection of television programming. Figure 14b shows additional major menu 1020 categories, 1042, 1044, 1046, 1048, which may used with the invention. Again, the introductory menu 1000 followed by the home menu 1010 is the preferred sequence of on-screen displays. In the preferred embodiment shown in 14a, the home menu 1010 provides a choice of ten major menus 1022, 1024, 1026, 1028, 1030, 1032, 1034, 1036, 1038, 1040. Upon selection of a major menu 1020 category from the home menu 1010, the program proceeds to a major menu 1020 offering further viewer selections. Each major menu 1020 is customized to target the expected viewership. Depending on the number of available program choices the major menus 1020 either breakdown the major category into sub-categories or provide the subscriber with access to further information on a particular program.

For example, the major menu 1020 for children's programming provides a list of subcategories 1052 from which the subscriber selects. Upon selection of a subcategory a submenu 1054, 1056 listing program choices within that sub-category is shown to the subscriber. Upon selection of a particular programming choice within the first submenu 1050, the subscriber is then provided with a second submenu 1058 describing the program that the subscriber has selected. From this menu, the subscriber may now confirm his program choice and receive a confirmation submenu 1060 from the set top terminal 220 software.

Since the system utilizes digital signals in compressed format, High Definition Television programming can also be accommodated through the menu system. In addition, since the set top terminal 220 has two way communication with the cable headend, interactive television programming is possible, with return signals generated by the set top terminal 220. Similarly, the system can support "movies on demand" where a subscriber communicates through the set top terminal 220 with an automated facility to order movies stored at the facility.

Using this on-screen menu approach to program selection, there is nearly an unlimited number of menus that can be shown to the subscriber. The memory capability of the set top terminal 220 and the quantity of information that is sent via the program control information signal are the only limits on the number of menus and amount of information that can be displayed to the subscriber. The approach of using a series of menus in a simple tree sequence is both easy for the subscriber to use and simply implemented by the set top terminal 220 and remote

control device 900 with cursor movement. A user interface software programmer will find many obvious variations from the preferred embodiment shown.

Figures 15a and 15b show examples of introductory menu screens that are displayed on the subscriber's television. Figure 15a, the preferred embodiment, welcomes the subscriber to the cable system and offers the subscriber three options. The subscriber may choose regular cable television (channels 2 through 39), programs on demand (e.g., movies), or instructions on the use of the remote control 900. Other basic program options are possible on the introductory menu screen 1000. For example, instead of, or in addition to, the remote control 900 instructions, a system "help" feature can be offered on the introductory menu 1000.

Fig 15b shows an alternate embodiment for the introductory menu screen 1000. In the upper left-hand corner of the menu, there is a small window 1002 that may be customized to the subscriber. A subscriber will be given the option of showing the current time in this window. In the upper right-hand corner a second customized window 1004 is available in which a subscriber may show the day and date. These windows may be easily customized for subscribers to show military time, European date, phase of the moon, quote of the day, or other informational messages. These windows may be customized by subscribers using on-screen menu displays following the introductory menu 1000.

In the preferred embodiment, the subscriber is given the capability of accessing base channels such as regular broadcast TV and standard cable channels directly from the introductory menu 1000 by entering the channel number. The

subscriber is also given the capability of directly accessing his account with the cable company. Further, in the preferred embodiment, the subscriber may directly access a major menu 1020 and bypass the home menu screen 1010. If the subscriber is familiar with the programming choices available on the major menus 1020, he may select an icon button 960, or a lettered key (alpha key) from his remote control 900 and directly access the desired major menu 1020. If any key entry other than those expected by the set top terminal 220 software program is made, the home menu 1010 is placed on the television screen. In addition, after a period of time if no selections are made from the introductory menu 1000, the program may default to the home menu screen 1010.

Figures 16a, 16b, 16c, and 16d are examples of home menus 1010 that may be used in the set top terminal 220 software. Figures 16a-16d all employ multiple window techniques to make the menu user friendly and offer a significant number of choices. It is preferred that a channel line up and the major menu 1020 categories both appear on the home menu 1010.

Figure 16a, the preferred home menu 1010 embodiment, displays both the standard channel line up and the programming on demand icons for selection by the subscriber. Figure 16a also shows various levels of subscription programming, including a "Basic"cable package and a "Basic Plus" package. Each of the choices of subscription programming preferably is assigned a different color. This increases the user friendliness of the present invention.

In Figures 16b-16d, the left half of the screen is used to list the channel number and network abbreviation of the most popularly watched networks. The right half of the screen offers access to a variety of major menus 1020 listed by category names.

Figure 16b shows an embodiment in which only eight major menus 1020 are utilized. By pressing the alpha-numeric or icon key 960 corresponding to the category of programs the subscriber desires, the appropriate major menu 1020 is accessed. In addition, the subscriber may employ an on-screen cursor to select any option shown in the menu. To move the cursor, the subscriber may use either the cursor movement keys on the remote control 900 or similar keys located at the top of the set top terminal 220.

Figure 16c shows how additional major menus 1020 can be displayed on the home menu screen 1010. When there is no longer room available for additional major menu 1020 choices on the home screen, the subscriber may access a second screen of the home menu 1010. For example, in Figure 16c, if additional major menus 1020 "J" through "Z" existed, the subscriber would access those menus by highlighting and selecting the J through Z menu option(or press the J-Z on his remote 900). After selecting J through Z, the second or extended home menu screen 1010 would appear on a subscriber's television set. This menu would then list options J through Z separately by name. Theoretically, the home menu 1010 may have many extended home menu screens. However, any more than a few extended home menu screens would confuse the average subscriber.

The home menu 1010 of Figure 16d adds an additional feature at the bottom of the television screen 1011. This option allows a subscriber to see only those program selections that are available on broadcast television. Figures 16a-d are but a few of the numerous variations available for the home menu 1010.

Additionally, as shown in Figure 17, in an alternate embodiment, the home menu 1010 (or menu which would normally follow the introductory menu 1000) can be simply the standard cable channel line-up. Offering the standard cable line-up on a separate menu may make selection easier for viewers with small television screens.

Figures 18a and 18b are examples of major menus 1020. In particular, Figures 18a and 18b show a major menu 1040 whose category is hit movies. The hit movie category is a list of recently released movies which have been found to be popular among movie goers. This movie list is changed once or twice a week to keep in line with new movie releases. Again, multi-window and customized window techniques are utilized to make the menu as user friendly as possible.

Figure 18a shows the preferred embodiment of the hit movies menu 1040. The hit movies menu icon along with the hit movies category letter A are displayed. The current date and time are displayed at the top of the screen over a menu background. Ten movie selections are displayed in the center of the screen 1009, each in a box which may be highlighted when selected. In the lower left part of the screen, a logo window 1512 is available as well as two other option choices 1011, Movie Library and Return to Cable TV. In an alternate embodiment, the return to

Cable TV option is changed to return to the Home menu 1010 (or return to other viewing choices).

In Figure 18b, the left upper window 1002 displays current time and the right upper window 1004 displays a message. This menu provides a list of eight movie titles and their rating 1009. If the subscriber desires further information on any particular movie he may select a movie using the cursor movement buttons and press the "go" button on the remote control 900 or set top terminal 220 box.

It is important in creating user friendly interfaces that the menus are consistent and follow a pattern. A manner of making the menus is discussed below with respect to Figures 55 and 56. This consistency or pattern between the different menus provides a level of comfort to the subscriber when encountering new menus. In the major menu 1020 example of Figure 18a, the upper sash 1502 and lower sash 1504 remain consistent throughout menus in the preferred embodiment. The logos 1508, icons 1510 and titles also remain consistent in the same locations.

In the major menu 1020 example of Figure 18b, the customized windows 1002, 1004 in the upper corners remain constant from menu to menu. Also, the name of the menu and category are at the top and center of the menu screen 1039. To make the menu aesthetically pleasing, the instructions are given across the center of the screen and choices in large legible type are provided. Additionally, at the bottom of most menu screens 1011, the subscriber is given the option of returning to regular TV or returning to the home menu 1010.

Figures 18c-18g show alternative embodiments of major menus 1020 for the home menu shown in Figure 16a. Figures 18c-18g show various major menus directed to the type of subscription services available (basic service 1420, basic plus 1422, economy package 1424, ala carte and premium channels 1426). These menus also provide promotional or advertising information, for example, the cost for the particular subscription service. Figure 18g shows a major menu for the Learning Channel 1428, one of the individual channels shown in the home menu of Figure 16a.

These menus may be grouped in similar colors or shades of colors. For example, the basic subscription service could have a light pink color. As the subscription services increase in terms of the number of channels available, the color shading may increase correspondingly. Therefore, the premium subscription service (ala carte service) would have a dark red color, contrasting with the light pink color of the basic subscription service.

In Figure 18b, the movie titled Terminator Four is highlighted, signifying that the subscriber has chosen this program option from the hit movie major menu. Figures 19a and 19b show submenus 1050 which would follow the selection of Terminator Four on the hit movie major menu. In Figure 19a, the sash across the top of the screen 1502 remains constant from major menu 1020 to program description submenu 1050. Again in Figure 19b, for the comfort of the subscriber, the left upper window 1002 remains the same and shows the current

time. The upper right-hand corner 1004 carries a message stating the next start time for the movie selected.

In order to allow subscribers to view hit movies at their convenience, multiple start times for the same movie are provided. In order to provide the multiple start time service, the same movie must be shown on multiple channels at staggered start times. For example, if Terminator Four is a two-hour length movie it can be shown continuously on eight different channels, with each showing delayed fifteen minutes after the previous showing. This allows the subscriber to begin viewing the movie within a fifteen minute time interval. Since the subscriber is not required to find the channel which has the correct start time, the subscriber is unaware that the movie is being shown on eight different channels. In fact, with the use of the submenus 1050, a subscriber is able to nearly effortlessly choose the correct channel and correct activation time for viewing the desired movie. The channel selection is invisible to the subscriber.

The set top terminal 220 is able to automatically determine which channel will next begin to show the selected movie using any number of techniques. For example, the set top terminal 220 will have an internal clock representing the current time. The set top terminal 220 could compare the current time with the start times for the movie on the various channels. Alternatively, a signal could be sent with the movie on all channels. This signal will set, or reset, a counter to indicate that a particular channel will next begin the movie. Those

skilled in the art may recognize that other methods to determine the next available start time and channel for the selected movie are available.

The Figures 19a and 19b movie description submenus 1120 retain the title in a window at the top center of the screen. A multiple window technique is used in the middle of this menu to display a description of the movie and one or more video frames that assist the subscriber in selecting the movie. This window of video 1556 that is provided by the menu may be a still picture, a short but repetitive video cut, or a portion of the movie that is currently showing on any one of the channels carrying the movie at the time of the submenu's 1050 display.

Just below the video window, the submenu provides the cost of viewing the movie and the movie length in hours and minutes. An additional strip window 1558 is provided, below the video and description windows, informing the subscriber of the movie's release date.

Moving towards the bottom of the menu, the subscriber is given at least three options. One, the ability to order the movie 1009, two, to return to the hit movie menu 1011, and three, to press "go" and return to regular TV 1011. In the preferred embodiment, the subscriber is also given the option of previewing the movie. Figures 19a and 19b show that the Order option has been selected by the subscriber 1009.

Figures 20a and 20b show the next submenu 1125 in the hit movie menu sequence from the selection of Terminator Four. This particular submenu 1125 shows confirmation of the subscriber's hit movie order of Terminator Four.

Figure 20a retains the sash across both the top 1502 and bottom 1504 of the screen. The format of the Figure 20b menu 1125 maintains the current time in the left upper window 1002, the title in the top center window, and the next start time in the upper right-hand window 1004.

The center of the submenu screens 1125 is a video window 1556 which may be used for still or moving video. The submenu provides the subscriber with two on-screen options. The subscriber may return to regular TV 1009 or may join the movie Terminator Four already in progress 1011. In an alternative embodiment of this submenu 1125, the user is given the ability to return directly to the home menu screen 1010.

When the movie's start time is approaching, the set top terminal 220 will automatically bring the viewer to the correct channel carrying the movie Terminator Four.

Figures 21a and 21b are notification submenus informing the user that his program selection is about to begin (e.g., counting down until start time). Using this submenu, the set top terminal 220 warns the user prior to switching him away from the channel he is viewing to a prior selected program channel. This notification submenu is provided to the subscriber approximately one or more minutes before the set top terminal 220 changes the viewing channel.

Both notification submenu examples allow the subscriber to cancel his movie order. In Figure 21a, the subscriber is notified in the center of the screen that he may cancel within the first five minutes. In Figure 21b the subscriber may press

escape to cancel his order without charge. The notification submenu of Figure 21b informs the user of the start time at the upper right portion of the screen.

The notification submenu of Figure 21b is a simple three-window menu. A strip window at the top of the screen 1103 notifies the subscriber of the movie selected and the amount of time before the movie will begin. The center window is a large video window 1556 for displaying a scene from the movie. At the bottom of the screen the submenu carries another strip menu 1105 which informs the user that he may escape from his program selection without charge.

Using a notification submenu 1127, the set top terminal 220 may allow a subscriber to view other programs prior to his movie start time. The subscriber is amply notified of the start time of his program and effortlessly moved to the correct channel to view his selected program. This notification-type submenu may be used to move a subscriber from his current channel to any preselected channel for viewing a program which has been ordered at an earlier time. In the preferred embodiment, the amount of time provided by the notification submenu may be customized by the subscriber to a length of his preference. The notification submenu also allows a subscriber to cancel or escape from his previously selected program choice and avoid any charges. If a subscriber cancels or escapes he is returned to the channel that he is currently watching.

As shown in Figure 22a, in the preferred embodiment, the subscriber is given a During Program Menu, specifically an Overlay menu 1130 to inform him

when his five minutes of movie escape time have expired. Once the time has expired the subscriber will be billed for the movie selection.

Figure 22b is an overlay menu 1133 warning the user that he is escaping a program after being charged for the order of that program. The warning overlay menu 1133 of Figure 22b follows in sequence and is prompted by a hidden menu which constantly monitors for subscriber input during viewing of the program. The hit movie hidden menu (not shown) specifically waits for certain key entries by the subscriber. In particular, the hit movie hidden menu awaits for a key stroke such as escape, cancel or an icon selection. If the escape button is depressed during the viewing of a hit movie the overlay menu of Figure 22a or Figure 22b will be shown. A strip menu in the lower sash of Figure 22b allows the subscriber to resume full screen viewing of the hit movie.

Figure 22b is a representative example of an overlay menu 1133. It has a dark lower background sash and a light colored informational sash. The upper portion of the screen continues to display the video of the program selected. Figure 22c is a reentry to ordered selection submenu 1135 for the hit movie category. The reentry to ordered selection submenus appear whenever a subscriber selects a programming option (program, event, or subscription channel), that the subscriber has already ordered. This menu has a program title window with a text title entry, and a description of the order that has already been placed for the program (or channel). In the preferred embodiment, the submenus which allow reentry to ordered selection provide the subscriber with the added option of joining the

program within any fifteen minute interval. This special feature of the preferred embodiment allows a subscriber who has viewed one-half of a particular program to rejoin the program at the half-way point. In this manner, the program delivery system mimics a VCR tape recording of the program. For example, if a subscriber had rented a videotape of the movie Terminator 4 and had watched thirty minutes of the movie, he would have left his videotape in the thirty minute position. With the menu of Figure 22c a subscriber to the system who has watched thirty minutes of Terminator 4 may reenter the Terminator movie at the thirty-one to forty-five minute interval as shown in Figure 22c. The nine-fifteen minute blocks of the menu display blocks are representative of the choices available for a two-hour hit movie. Other variations are possible depending on the length of the movie and the timing intervals desired.

Figure 23 shows the major menu for the movie library category 1048. The movie library category provides subscriber access to a large number of movies. Using several transmission channels, each movie in the library is shown at least once during a one-month period. Using the movie library, a subscriber may access information on a particular movie and ascertain the various start times for that movie. In the preferred embodiment, the subscriber will use the movie library in conjunction with his VCR or other video taping machinery. In that way, a subscriber may tape movies which are shown at inconvenient start times for later viewing. By activating the proper features of the set top terminal 220, a subscriber

may have the terminal activate the television and the VCR and perform all the functions necessary to tape a movie.

The movie library major menu shown is an extended menu having many follow-on extensions to the major menu shown. The extended menus continue to show lists of movies in alphabetical order. In an alternative embodiment, the movie library is broken down into subcategories of various types of movies. For instance, movie categories such as murder-mystery, documentaries, westerns, and science fiction would appear on the movie library major menu. By selecting one of these movie library subcategories the subscriber would be moved onto a particular submenu for that movie library subcategory. Each submenu would list movie titles whose contents fall within the particular subcategory.

Following a selection of a movie title, the subscriber is displayed a movie description submenu. Figure 24 shows a typical movie description submenu 1140. In order to maintain a similar pattern throughout the menus, Figure 24, movie description submenu 1140 for the movie library, is designed similarly to Figure 19b which is a movie description submenu for the hit movies category. The primary difference between Figures 24 and 19b is the display of the movie library title number in the upper right-hand corner of Figure 24. Figure 24 provides three options for the subscriber. The subscriber may order the movie described, return to the movie library major menu, or return to regular TV.

Figure 25 shows a confirmation submenu 1142 for the movie library. This menu screen confirms the movie selection, start date, start time and informs

the subscriber that his VCR will be automatically turned on. During this submenu, the user may return to the movie library major menu, return to regular TV or cancel his movie library order by pressing the escape button. Figure 25 shows that the subscriber has selected to return to regular TV. The subscriber's VCR or other video taping equipment must be connected to the set top terminal 220 for the automatic taping feature to operate.

The series of Figures 26a, 27a, 28a and 29a, and the series of Figures 26b, 27b, 28b, and 29b depict a typical menu sequence including a major menu 1028, 1042 (Figures 26a and 26b), a subcategory submenu 1148 (Figures 27a and 27b), a program description submenu 1152 (Figures 28a and 28b), and a confirmation submenu 1154 (Figures 29a and 29b). This simple progression of menus repeats itself through the menu tree of Figures 14a and 4b.

In the preferred embodiment, Figures 26a, 27a, 28a, and 29a are a series of menus which are categorized in the Documentary and News Major category. Whereas in the alternate embodiment, Figures 26b, 27b, 28b, and 29b are a series of menus that relate to the Discovery® video selection services category. Figure 26b is the Discovery video selection service major menu 1042. This major menu shows twelve different categories of services available to the subscriber. The upper right-hand corner window of this major menu briefly describes the types of services which are available on this menu. After selecting a subcategory from this major menu the set top terminal 220 moves the subscriber to a submenu describing programs that are available in the subcategory. Figures 26a and 26b show that the

subcategory Discovery channel choice has been selected by the subscriber from a major menu.

Figure 27a is a submenu for subcategory Discovery channel choice 1148, and shows six programming choices available for this subcategory. In an alternate embodiment, Figure 27b displays only four program choices. By choosing one of the programming choices on this Discovery channel choice submenu, the subscriber may obtain more information about the particular program. Again, the subscriber is able to return to the major menu or return to regular TV by selecting options in the lower part of his screen. In Figures 27a and 27b, the subscriber has highlighted and selected the program War Birds for further description.

Figures 28a and 28b are description submenus 1152 which describe an available program, War Birds. Since the preferred embodiments follow a pattern throughout the menus, Figures 28a and 28b are similar to Figures 24, 19a and 19b which describe other programming selections available on the system. Figures 28a and 28b use the upper right-hand corner window 1004 to inform the subscriber of the next start time available for the particular program War Birds. In packaging the special selection of programs, the programmer at his option may show an identical program on several channels in order to permit the subscriber greater flexibility in start times. Figures 28a and 28b show the use of a strip menu across the lower half of the screen displaying a message and the price of the program. Similar to other submenus, the subscriber may order the program, return to the major menu, or

return to regular TV simply by selecting the choices on the lower part of his screen. Figures 28a and 28b depict the subscriber ordering the program War Birds.

Figures 29a and 29b are confirmation submenus 1154 similar to confirmation submenus in other major menu categories. It confirms the subscriber's order of the program War Birds. The Figure 29a confirmation submenu retains the video window from the prior submenus and also displays the program running time. The submenu of Figure 29b shows a strip window 1105 on the lower part of the screen displaying an "800" number and advertising the Discovery catalog. Similar windows may be used throughout submenus to assist in advertising for particular programs, channels, or groups of programs. Many variations of the confirmation submenu are possible.

This confirmation submenu allows the user to join the selected program already in progress or return to regular TV. In addition, by depressing the escape button, the subscriber may cancel his order of War Birds from this screen.

Figure 29c is an example of an overlay menu 1156 presented when a subscriber is exiting from a program selection in which he may rejoin at a later time. This exiting ordered program overlay menu 1156 is appropriate whenever a subscriber may return to a program or channel without additional charges. Since many of the programs selections are authorized for viewing on a two-day, weekly, or monthly basis, the exiting ordered program overlay is useful in a number of situations.

This overlay menu follows a similar format as other overlay menus having a darker colored lower sash and lighter colored second sash with text information. The sashes are overlayed on the program video currently being watched by the subscriber.

Additionally, an exiting ordered program overlay menu 1156 may be provided for one-time viewing program selections which a view cannot return. These exiting ordered program overlay menus would thank the viewer for ordering the particular program or channel and entice the viewer to order a similar program from the same network. For example, an exiting program overlay menu for a live sports event such as boxing, would thank the viewer and remind him that the network carries regularly scheduled boxing events on a weekly basis.

Figures 30 through 34 relate to the ordering of specialty channels through the menu driven system. Figure 30 is a major menu 1044 that lists fifteen specialty channels that are available for subscription and viewing. In this particular major menu 1044, the lower half of the screen 1009, which is utilized to provide the various programming choices, is divided into three vertical sections allowing room for fifteen choices. This major menu category is different from the others in that individual programs are not ordered but instead channels are subscribed to on a monthly or yearly basis. To use this submenu, a subscriber need only select and press "go" on the channel of his choice.

After the subscriber selects a channel, the channel description submenu 1160 of Figure 31 replaces the major menu on the subscriber's television screen.

This description submenu 1160 has windows that are similar to other description submenus used throughout the menu driven system. In this description submenu 1160, the upper right-hand corner 1004 is used to display the subscription cost for the channel. The upper left-hand corner 1002 of this submenu is used to display the method in which the subscription price will be billed to the subscriber. In this specific scenario, the current time has little bearing on the subscriber's decision to order the displayed channel and therefore is not shown on the television screen. Figure 31 shows that the subscriber has ordered the Science Fiction channel.

Figure 32 shows a submenu 1164 which confirms the subscriber's order and thanks him for subscribing. If the subscriber is already paying for the selected channel, instead of Figure 32 confirming his order, he is provided with the divided menu 1156 of Figure 33 informing him that he is a current subscriber of the Science Fiction channel. In both the screen of Figure 32 and the screen of Figure 33, the subscriber is allowed to join the channel in progress. After an ample period of time for the subscriber to read the screen menu, the menu is removed from the television screen and the subscriber has a complete view of the programming in progress. This is shown in Figure 34 for the Science Fiction channel.

Figures 35-38 refer to the selection of a magazine channel. In particular, Figures 35-37 show a series of menus for selecting and ordering one specific magazine channel, the sci-fiction channel.

Figure 35 shows a major menu for magazine channels 1030. This major menu falls under the letter F, Major Menu, and has an icon showing three

magazines. The magazine channel major menu has a menu display block with 15 options, three columns, each with five selection options. Magazine channels are specialty channels targeted to a particular audience. In the preferred embodiment, each of the magazine channels has a monthly subscription. Figure 35 shows the sci-fiction magazine highlighted.

Figure 36 is a channel description submenu 1170 for the science-fiction channel. This menu has a network logo in the upper left hand part of the screen generated from the logo graphics file 820. The name of the channel is prominently displayed across the top. In the preferred embodiment, the text for a channel or network name is stored in long-term text storage. The text description of the channel on the right part of the screen may also be stored in long-term text storage. A video window 1556 and a video description window are also shown. This channel description submenu is similar to other program description menus and exemplary of the channel description submenus for any magazine channel.

If the subscriber orders a science-fiction channel, he will receive the confirmation menu 1172 shown in Figure 37. This is a representative confirmation menu for subscribing to any network channel. A second sash of approximately equal width to the upper sash of the background menu is displayed in a color preferably different than that of the upper sash. Within the confirmation sash, a network logo and a standard text description thanking the subscriber are placed on the screen. At any time during this menu screen, the subscriber may cancel his

subscription to the channel by pressing cancel on his remote 900 or set top termination button 645.

In the preferred embodiment shown, the area of the screen below the two sashes is filled with video from the channel being subscribed. In an alternative embodiment, further text information is provided instead of a video display.

Figure 38 shows a reentry to ordered subscription submenu, similar to submenu 1156 in Figure 33. This particular reentry submenu (magazine channel reentry submenu 1173) is for the magazine channel Gourmet. A light colored second sash is provided at the top of the screen with the network logo and text informing the subscriber that he has already ordered this particular channel. The reentry submenus 1156 generally allow a subscriber to immediately join programming in process. The current program on the Gourmet channel is shown in most of the remaining portion of the screen.

In this particular preferred embodiment shown, a special title sash is included as an overlay in the lower portion of the screen. This sash identifies the current program being shown on the channel with a text description. The set top terminal may derive this text description from either the STTCIS, the VBI, or other digital signals.

Figures 39-42 show a series of menus for selecting the documentary news program from the CBS library, called 60 Minutes. Although this is a regularly scheduled weekly program, it may be viewed by subscribers to the present invention at nonscheduled times. Figure 39 shows a major menu 1028 for documentary and

news programs. This major menu has a specific icon and letter designation which are shown in the upper left hand corner. This major menu has 12 selection options 1009 in the menu display blocks. They comprise two rows, each with six options. In this particular menu, the upper left hand corner option is highlighted. In general, the upper left hand corner option is the default for the cursor highlight overlay 1526.

Figure 40 shows a subcategory submenu 1174 displaying five options. This subcategory menu shows specific programs which are available. The cursor highlight overlay is at the top of the screen in its default position. From this cursor position, the subscriber may order the program 60 Minutes.

Figure 41 shows the next menu in the sequence for ordering the program 60 Minutes. This program description submenu 1176 displays the network logo, program title, program description, video window, video description window, and the next program start time. In the preferred embodiment, the next program start time is displayed beneath the current time. The program title and program description text may be stored in the intermediary text storage 877. In the preferred embodiment, the video description window 1556 displays running time and price of program. If the subscriber orders the program from the program description menu, he is sequenced to a confirmation menu.

Figure 42 is a confirmation submenu 1178 for the program 60 Minutes. In this embodiment shown, the program description menu and confirmation menu are nearly identical. The primary difference being the confirmation text description

and ability to join the program in progress. In the embodiment shown, the confirmation text is customized for the particular subcategory CBS Library. In alternate embodiments, the confirmation text is a standard text being generated from long-term text storage. Confirmation submenus may be designed to show the user more video and less menu graphics and text.

Figure 43 is a major menu 1026 for category E, Entertainment Choice. The Entertainment Choice category shows the best entertainment programming available during a given week. Figures 43 and 44 show the selection of a program in the Entertainment Choice category. The Entertainment Choice major menu 1026 has a menu display block for five programs.

Figure 44 shows a program description submenu 1182 for a selection on the Entertainment Choice major menu. In this program description submenu, the next start is shown in the upper right hand corner. The program title text is shown centered, along with program description text on the right half of the screen. The video window and video description window are provided on the left half of the screen. In the particular embodiment shown, the price of the program is placed on the first line of text in the video description and the run time is shown on the second line of text in the video description window. The program may be ordered by highlighting the menu display block beneath the program description text using cursor movement keys. This submenu 1182 allows the subscriber, via a strip menu located in the lower sash, to return to the major menu, namely menu E 1026.

Figures 45 and 46 relate to the category of Children's Programs. Figure 45 is the major menu 1024 for Children's Programs, displaying five program options in its menu display blocks. Figure 46 is a program description submenu displaying the program Beauty and the Beast. This program description submenu is similar to that shown in Figure 44. Again, a strip menu in the lower sash allows the subscriber to return to the major menu, in this case, menu C 1024. In alternative embodiments, the subscriber may return to the home menu from any submenu screen. This return to home menu feature may also be embodied in a strip menu in the lower sash.

Figures 47, 48, and 49a-49d relate to menus available within the major category of Sports. Figure 47 is an example of a major menu screen 1022 for the Sports category. This window exemplifies the ability to mix pay-per-unit programs, free programs, and a subcategory selection, all within one major menu screen. This is also representative of the mixing of programming types and subcategories that may be conducted at any menu level (major menu or submenu). By highlighting one of the three menu blocks shown, the subscriber may obtain more information on each of the three different types of programming that are available.

Figure 48 is a program description submenu 1222 for NFL Highlights, which a subscriber would receive if he made the NFL Highlights selection on the major menu 1022 of Figure 47. In particular, Figure 48 shows a program description submenu for a program which must be paid for once each week for viewing. Once

the program has been ordered by that particular set top terminal, the terminal is authorized to allow subscriber viewing for the remainder of the football week.

Figures 49a-49d illustrate the manner in which a category or subcategory of programs may be shown in a weekly schedule 1224. Seven of the menu display block options of Figure 49a are for daily live events. The eighth menu selection block in the lower right hand corner of the menu display blocks allows the viewer to see what live programming is available during the month. In this manner, future television programs may be advertised.

Figure 49b shows a live programming event menu 1226 which is available only on a particular day. Since the text description of this menu may be updated at least once a day, circumstances which affect the live program may be described in the text. For example, in a single elimination tennis tournament, the star tennis players who have not been eliminated may be listed in the text. From this menu, the subscriber may return to the subcategory submenu, Sports Events, or return to the major menu letter B, Sports, or return to cable TV. In the preferred embodiment, the subscriber is given the ability to sequence back to his last menu screen and, in some instances, sequence back to subcategory menu screens.

Figure 49c and 49d relate to programming on a particular day (Saturday). The submenu of 49c falls within a subcategory of a major menu and is therefore three menu sequences below the home menu. This particular menu 1228 lists an odd number of programming options. The menu display blocks allow 12 football games selections and one boxing event, which is a larger box across the

lower part of the screen. By changing the menu display block sizes, the packager can focus the subscriber's attention on a particular program. Menus may show standard time, such as eastern time, or may show regional times to the subscriber.

Figure 49d is a program description submenu 1229 whose description text will generally remain constant for a period of one week. The program title text "College Football" is frequently used and may be stored in long-term text storage.

Figures 50a and 50b relate to HDTV. Figure 50a is an example of a menu 1032 advertising a new feature of the system. Promotional menus, such as Figure 50a, may be dispersed throughout the menu driven program selection system. This particular menu describes the HDTV feature and explains its unavailability until a future date. Figure 50b shows the integration of HDTV services into the menu driven program delivery system. If the subscriber selects the major menu for HDTV, he will either receive a description of the service with a suggestion to order the system, or a text note that he is a current subscriber and a listing of the currently available program selections in HDTV 1232. If the subscriber has not paid to join the particular service, HDTV, he may be allowed to join one of the programs in progress for a limited time as a demo to entice the subscriber to order.

If the subscriber has paid his HDTV fees, a subscriber proceeds as he would in any other major menu screen.

This particular major menu shows an example of how a follow-on or second screen may exist for the same menu. In this particular case, a second screen

exists for the major menu HDTV 1032. The subscriber may access the second screen 1232 by selecting the last menu display block in the lower part of the screen "Other HDTV Selections". Following this selection, the subscriber will be given a second screen of program selections. In this manner, any menu can have multiple screens with many program choices. This type of screen pagination on one menu allows the packager to avoid categorizing program selections within that same menu. In an alternative embodiment, the options available to the subscriber may be scrolled on one menu screen with the text within the menu display blocks changing as the subscriber scrolls up or scrolls down.

In the preferred embodiment, TV guide services, listing programs available on network schedules, will be available on a major menu, as shown in Figure 51a. In the preferred embodiment, the major TV guide menu 1036 would offer submenus, such as network schedules for the next seven days, today's network schedules for the next six hours, and TV guide picks for the next seven days. If the particular set top terminal 220 has been subscribed to the TV guide service, the subscriber may proceed to a submenu showing schedules of programs. If the subscriber chooses the network schedule submenu 1236, he is offered a list of network schedules to choose from as shown in Figure 51b. If a subscriber were to choose, for instance, HBO, the submenu 1238 shown in Figure 51c would appear. This submenu allows a subscriber to choose the program date that interests him. Following selection of a date, the subscriber is shown a more specific submenu 1242 listing programs available on the particular date as shown in 51d.

Following a program choice, a program description submenu 1244 is placed on the television screen as shown in Figure 51e. In addition, from this program description submenu, the viewer may choose to record the selected program on his VCR using the guide record feature. If the guide record feature is chosen, the guide record submenu 1248 shown in Figure 51f provides the subscriber with further instructions. In order for the set top terminal 220 to perform the guide record functions and operate the VCR, control signals must be sent from the set top terminal 220 to the VCR via the video connection 650 or via a separate connection between the set top terminal 220 and the VCR. The VCR must be capable of interpreting these control signals from the set top terminal 220 and performing the desired function (such as, activating the record feature). In the preferred embodiment, the VCR control signals are sent with the video signal and output from the output 650, as described above.

Figures 51g and 51h refer to the broadcast TV menu option available in Figure 14b. Figure 51g is a major menu 1046 displaying subcategories of programs available on a group of channels called generically "broadcast TV." For each subcategory there is a separate submenu listing programs that are available in the particular subcategory on a group of channels called broadcast TV.

By using the broadcast TV menu, the subscriber does not need a written guide of available television programming on the major networks. Although the preferred embodiment categorizes television programs available on the major networks, a simple chronological listing of programs may also be used.

Following a subcategory selection on the broadcast TV menu such as favorite channels, the set top terminal 220 will display a submenu of programs as shown in Figure 51h. The favorite channel program menu 1256 of Figure 51h allows the subscriber to choose among eight programs in progress at 9:45 p.m. on a broadcast TV network.

Using this methodology, the subscriber may also be allowed to choose among television programs which will be available for viewing in the next half hour or hour. When the time of the preselected program is approaching, the set top terminal 220 will display a notification menu or window to the subscriber (similar to Figure 21a and 21b) informing him of an eminent change of channels to a previously selected program.

In order for the set top terminal 220 to establish a favorite channel list, menus querying the subscriber and allowing the subscriber to input his selection of eight favorite channels must be displayed. Alternatively, the set top terminal 220 box can "learn" which channels are a subscriber's favorite channels. A simple learning process would involve the set top terminal 220 determining which channels were the most often watched and assume those channels are the subscriber's favorite channels. Favorite channels are preferably stored in memory in the set top terminal 220. Figure 51g, the broadcast TV menu 1046, has a separate category for often watched channels which allow the subscriber or the set top terminal 220 in a learning mode to choose eight additional channels for display.

In a manner similar to learning the most often watched channels of the subscriber, the terminal can also determine the most often watched shows by the subscriber. After developing (or learning) a list of popular shows or querying the subscriber for a list of popular shows the terminal can display a submenu allowing the subscriber to choose one of his popular shows for viewing.

In order for the set top terminal 220 to develop submenus for subcategories in Figure 51g which relate to the content of the programs, the terminal must receive information on the content of the programs from the Operations Center 202 (via the cable headend 208). Normally the set top terminal 220 would receive this information in the form of the program control information signal (or STTCIS).

Although various embodiments of menus for broadcast TV are possible, the goals of each are the same -- to eliminate or augment printed guides to television programs.

In an alternative embodiment, a program viewing suggestion feature is available as an additional feature. This feature gives the indecisive viewer or lazy viewer suggestions as to which programs he should watch. The set top terminal 220 uses a matching algorithm to accomplish the program viewing suggestion feature.

In order for the set top terminal 220 to make decisions on which programs the subscriber should watch, the terminal must create a personal profile for the particular viewer. From the data in the particular viewer's personal profile and the television program information available in the program control

information signal, the set top terminal 220 is able to select a group of programs which the particular viewer is most likely to watch.

In order for this feature to operate, the set top terminal 220 builds a personal profile for each viewer and stores the information in a memory file by viewer name. To build a personal profile, the viewer answers a series of questions presented on a series of menu screens. These personal profile screens request the viewer to input information such as name, sex, age, place of birth, place of lower school education, employment type, level of education, amount of television program viewing per week, and the number of shows in particular categories that the viewer watches in a given week such as, sports, movies, documentaries, sitcoms, etc. Any demographic information which will assist the set top terminal 220 in suggesting television programs to the viewer may be used.

Once a personal profile has been created (in a particular set top terminal 220), it can be indefinitely stored in nonvolatile memory. A selection at the home menu screen 1010 activates the program selection feature. Following activation of the feature, the set top terminal 220 will present the viewer with a series of brief questions to determine the viewer's mood at that particular time. For example, the first mood question screen 1260 may ask the viewer to select whether he desires a short (30 minute), medium (30-60 minute), or long (60 plus minute) program selection, as shown in Figure 51i. The second mood question screen 1262 requests the viewer to select between a serious program, a thoughtful program, or a light program, as shown in Figure 51j. And the third mood question screen 1264

requests whether the user desires a passive program or an active program, as shown in Figure 51k. The viewer makes his selection in each question menu utilizing the cursor movement keys and "go" button on his remote control 900. A variety of other mood questions are possible such as fatigue level of the viewer.

After the viewer has responded to the mood question menus which determine his mood, the set top terminal 220 finds the best programming matches for the viewer and displays an offering of several suggested programs to the viewer (three or more programs are preferred) . The matching algorithm compares the viewer profile data with information about the program derived from the program control information (or STTCIS) signal, such as show category, description type, length, etc. Using the personal profile information and mood questions suggested above, the following types of outcomes are possible. If the set top terminal 220 is presented with a young lady viewer, educated in Boston who watches sitcoms on a regular basis, and desires a short, light, passive program, a match might be found with the 30-minute sitcom Cheers, the sitcom Designing Women, and Murphy Brown. Taking another example, a middle-aged male viewer from the Boston area, wishing a longer length, light, passive program suggestion might be suggested the New England Patriots game, the Boston Red Sox game and a science fiction movie.

With this program selection feature, the set top terminal 220 can intelligently assist the specific viewer in selecting a television program. Instead of the set top terminal 220 requiring an input of personal profile information, the terminal may also "learn" a subscriber's viewing habits by maintaining historical

data on the types of programs the viewer has most frequently watched. This information can then be fed to the matching algorithm which selects the suggested television programs.

Using this methodology, it is even possible for the set top terminal 220 to suggest programs for two viewers. By using two sets of viewer profile information, the matching algorithm can find the best match for joint viewing. For example, the set top terminal 220 can suggest programs for a couple watching television simultaneously.

Figures 52a, 52b, and 52c demonstrate the use of promotional menus to sell subscriptions to services in the system. In particular, Figure 52a is a promotional menu 1304 for Level A interactive services. Level A interactive services offers subscribers additional information about programs such as quizzes, geographical facts, etc. This information may be received by the set top terminal 220 in several data formats including VBI and in the program control information signal. Figure 52b is a promotional menu 1306 for Level B interactive services which include a variety of on-line type services such as Prodigy, Yellow Pages, Airline Reservations, etc.

Figure 52c is a promotion menu 1308 for the Level C interactive services. The Level C interactive services utilize local storage such as CD technology to offer an enormous range of multi-media experiences. The Level C interactive services require a hardware upgrade as described earlier. Specially adopted CD-I and CD-ROM units are needed for this service.

Figures 52d through 52j show menus that are available using the interactive Level A services. When interactive Levels A services are available in a television program, the system will display the interactive logo consisting of the letter "I" and two arrows with semicircular tails. In the preferred embodiment the set top terminal 220 will place the interactive logo on the television screen as an overlay menu 1310. In the preferred embodiment, the set top terminal 220 will detect that there is data or information available about a television program which can be displayed to a subscriber using the interactive service. When the set top terminal 220 senses that there is interactive information available, it will generate the interactive logo overlay menu and place it on the television screen. For example, the set top terminal 220 will detect that information on a television program is being sent in the vertical blanking interval (VBI) and generate an interactive logo overlay menu which will appear on the subscriber's television screen for approximately fifteen seconds during each ten minute interval of programming.

When the subscriber sees the interactive logo on his television screen, he is made aware of the fact that interactive services are available in conjunction with his television program. If the subscriber presses his interactive remote control button, an additional overlay menu will be generated by the set top terminal 220 and placed on the screen. This menu 1310 is shown in Figure 52d being overlayed on an interactive television program. From this menu the subscriber may select interactive features or return to the television program without interactive features.

If the subscriber selects interactive features he will be presented with the interactive Level A submenu 1312 in Figure 52e. From this submenu the subscriber may choose a variety of different types of textual interactivity with the current television program. Some examples are quizzes, fast facts, more info, where in the world, products, etc. At any time during the interactive submenus the user may return to the television program without interactive features.

This interactive submenu has an example of taking a complete television program video, scaling it down to a smaller size and directing the video into a video window of a submenu.

Figure 52f shows an interactive fast facts submenu 1314. In this submenu textual information is given to the subscriber in the lower half of his screen. This textual information will change as additional data is received by the set top terminal 220 relating to this television program.

Figure 52g shows the use of the subcategory "more information" in the interactive service. This submenu 1316 gives additional information related to the television program to the viewer in textual form in the lower half of the screen. Figure 52h is an interactive submenu 1318 for the subcategory "quiz." In this interactive subcategory, the user is presented with questions and a series of possible answers. If the subscriber desires, he selects one of the answers to the quiz question. After his selection, the set top terminal 220 sequences to another menu. The set top terminal 220 sequences to the interactive quiz answers submenu which informs the subscriber whether he has chosen the correct answer or not. Figure 52i shows a

correctly answered quiz question 1320 and Figure 52j shows an incorrectly answered quiz question 1324. In the preferred embodiment, the menu graphics for both of these menus 52i and 52j is the same. The only difference is in the text which can be generated by the text generator of the set top terminal 220.

Figure 53a is an example of a submenu for Level B interactive services. From this menu screen 1330, any of a number of on-line data services could be accessed. In Figure 53a, the airline reservations selection has been selected by the subscriber.

Figures 53b through 53l provide an example of a sequence of menus that a subscriber may encounter with an on-line data service. In particular, this example relates to airline information and reservations and the subscriber in this sequence is reserving and purchasing airline tickets. Figure 53b is an example of the first submenu 1332 for a data service offering various options. In this case, the subscriber has the option of checking current reservations or making new reservations. In each of these submenus related to a data service, the subscriber is able to return to the home menu 1010 or regular cable TV and exit the data service. Figure 53c requires the subscriber to enter information related to his airline reservation in this submenu 1334, such as: domestic or international flight, year of flight reservation, month of flight reservation.

Figure 53d is another submenu in the airline information and reservation data service. Figure 53d provides an example of how the subscriber may choose among many options on a single screen 1336. In this manner, the preferred

embodiment of the system can avoid the use of a separate keyboard for textual entry. Although a separate keyboard may be provided as an upgrade, it is an added expense which some subscribers may wish to avoid. Figure 53d shows an "eye off the remote" approach to entering information. Figure 53d allows the user to chose the State in which he will depart and the state in which he will arrive. The airline information reservation submenu 1338 shown in Figure 53e allows a subscriber to choose the airports from which he will depart and arrive and also the approximate time period of his departure and his arrival. Figure 53f, an airline information and reservation submenu 1340, allows a subscriber to view six available flights. A subscriber may select one of the flights to check on its availability.

Figure 53g, an airline information and reservation submenu 1342, allows a subscriber to enter the month, day and year for the availability date he desires. In this submenu, the subscriber is offered the option of correcting any errors in the entered information. This particular submenu is for a particular flight, including flight number.

Figure 53h, an airline information and reservation submenu 1344, allows a subscriber to view remaining seats available on a flight. From the menu, the subscriber may select his seat assignments. This submenu is an example of how information may be graphically shown to a subscriber using a portion of the menu and different coloring schemes. In this menu, the lower half of the screen shows the passenger compartment of an airplane with all the seat locations graphically represented by square blocks. By coloring the available seat locations in blue and the

unavailable seat locations in a different color, the menu can present a great deal of information in a limited amount of space. This graphic presentation of information for the interactive on-line data services is an important method of visually displaying large amounts of information to the subscriber.

Figure 53i, an airline information and reservation submenu 1346, allows the subscriber to choose a one-way or round-trip ticket and to confirm his reservations. If the subscriber desires to proceed, he may charge his airline ticket to his credit card by choosing the appropriate strip menu on the lower part of the screen.

Figure 53j, an airline information and reservation submenu 1348, is an example of how credit card purchases may be made using the interactive on-line data services. In this particular menu, the subscriber is charging a round-trip plane ticket on his credit card. The subscriber simply needs to enter his credit card number, expiration date, and credit card type to charge his airline ticket.

Figure 53k, an airline information and reservation submenu 1350, is an example of a menu which may be shown whenever an on-line data service is processing a request sent by the subscriber. In this particular menu, the on-line data service is processing the subscriber's credit card charge for his airline ticket.

Figure 53l, an airline information and reservation submenu 1352, confirms a subscriber's airline ticket purchase and passes on information on where the ticket may be picked up.

Figure 54a is a major menu 1038 displaying the digital/audio program choices which are available for subscribers who have paid the monthly fee. In a chart format, the major menu shows the top five, top ten, and top forty songs available in six different categories of music. Below the chart, the system is able to provide a text message describing the particulars of the audio program selected.

The digital/audio feature of the invention allows a subscriber to listen to CD quality audio selections through his stereo. This can be accomplished by running cables directly from the set top terminal 220 to the subscriber's amplifier/stereo system. Alternatively, the user may listen to audio selections through his television system.

Figures 54d and 54e are the same major menu 1038 as Figure 54a but shows a different selection and a different program description in the lower text 1408, 1412. From any of the menu screens for the digital/audio feature, the subscriber may return to regular cable TV with the press of a single button.

Figures 54b and 54c are promotional menus 1400, 1404 for the digital/audio feature. Using the same logos and menu format, the system can provide a text description enticing the subscriber to pay the monthly fee and join the service. In Figure 54b, the menu allows the user to test the system with a free demonstration. The menu in Figure 54c allows the subscriber to request additional promotional information about the system. Both Figures 54b and 54c are representative of promotional menus that may be used throughout the menued system.

Figures 55a through 55g and Figures 56a through 56g, show how menus are generated by the set top terminal 220. Figures 55a through 55g display the building of a major menu screen for the category hit movies. Figure 55a shows the background graphics for the hit movie major menu. The background graphics 1500 comprise an upper sash 1502 across the top of the screen and a lower sash 1504 across the bottom of the screen. The background graphics are generated from the background graphics file 800 in the memory files of the graphics memory (preferably EEPROM) 620. In particular, the hit movie major menu background graphics are located in the universal main menu backgrounds subfile 804 of the background graphics file 800. This universal major menu background graphic 1500 is consistently used in nearly all the major menus. Figure 55b shows the logo graphics for the hit movie major menu. The logo graphics 1508 for this major menu consist of an icon window 1510 , a cable company logo 1512 in the lower left-hand portion of the screen, a channel company logo 1514 in the upper right-hand part of the screen and two "go" buttons 1516. The icon graphics 1510 are consistently shown in each of the major menus. The cable company logo 1512 is consistently shown in the lower left-hand part of the screen in nearly every major menu. These logo graphics 1508 are created from the logo graphics file 820 in the EEPROM 620. In particular, the cable company logo 1512 in the lower left-hand corner of the screen is located in The Your Choice TV logos 824 part of the logo graphics file. The network logo 1514 in the upper right-hand corner of the screen is generated from the network logo file

828 of the logo graphics file 820. The "go" buttons 1516 are generated from the graphic elements file 840 of the logo graphics file 820.

Figure 55c shows the addition of menu displays 1520 to the hit movie major menu. In particular, Figure 55c shows a ten block main menu display 1520 and a strip menu 1522 in the lower part of the screen. The ten display blocks 1520 of Figure 55c are generated from the menu display block's subfile 854 of the menu display and cursor graphics file 850 shown in Figure 10. The strip menu 1522 located on the lower part of the screen is also generated from the menu display block's subfile 854.

Figure 55d shows the addition of a cursor highlight overlay 1526 to the hit movie major menu. The cursor highlight overlay 1526 is generated from the cursor highlight overlay's submenu 858 of the menu display and cursor graphics file 850 shown in Figure 10. In the preferred embodiment, the cursor highlight overlay 1526 is shown by default to be in the upper left-hand menu display block of each major menu. This cursor highlight overlay 1526 can be moved on the screen by the subscriber using his cursor movement buttons 970.

Figure 55e shows the text 1530 generated for the hit movies major menu. In the preferred embodiment, the text 1530 is generated separately by a text generator in the set top terminal unit 220. Those portions of the text that generally remain the same for a period of weeks or months may be stored in EEPROM 620 or other local storage. For example, the text "HIT MOVIES from" 1531 will consistently appear on each hit movies' major menu. This text may be stored on EEPROM 620 or

other local storage. Further, text such as that which appears at the lower center part of the screen "PRESS HERE TO RETURN TO CABLE TV" 1532 appears many times throughout the menu sequence. This text may also be stored locally at the set top terminal 220. Text which changes on a regular basis, such as the movie titles (or other program selections), will be transmitted to the set top terminal 220 by either the operations center 202 or the network controller 214 of the cable headend 208. In this manner, the cable headend 208 may change the program selections available on any major menu 1020 by modifying the program control information signal sent by the operations center 202 and transmitting the change via the STTCIS. It is preferred that the text 1530 be generated separately from the graphics because the text can be stored locally in a more compact manner requiring less storage space. In addition, it allows for easy communication of text changes from the operations center 202 or cable headend.

In alternative embodiments, portions of the text, particularly those portions which remain constant, may be incorporated into the graphics and stored in either the background graphics file 800 or the logo graphics file 820.

Figure 55f shows the addition of day 1534, date 1536 and time 1538 information to the hit movies major menu. This information may be obtained in a variety of ways. The day, date, and time information 1540 may be sent from the operations center 202, the cable headend (signal processor or network controller 214), the uplink site, or generated by the set top terminal unit 220 internally. Each manner of generating the day, date, and time information 1540 has advantages and

disadvantages which may change given the particular embodiment and costs. In the preferred embodiment, the day, date, and time 1540 are generated at a central location such as the operations center and are adjusted for regional changes in time at the cable headend.

Figure 55g shows the results of the information in Figures 55a to 55f being integrated in the combiner 624 and then displayed on the television screen 222. The subscriber in viewing the hit movie major menu 1040 is unaware of the fact that the menu comprises several distinct part.

Figures 56a through 56g show the creation and display of a program description submenu for a hit movie. Similar to the major menu, the submenu is created in parts and combined before being sent to the television screen. Figure 56a shows the background graphics 1550 for the program description submenu. In the preferred embodiment, the upper sash 1552 and lower sash 1554 of the background graphics 1550 are stored together in one location on the EEPROM 620. The video window and half-strip window 1558 are also co-located in storage on the EEPROM 620. The half-strip window 1558 beneath the video window serves 1556 as a means for describing the videos shown in the video window 1556. Both sets of graphic information 1550, the sashes 1552, 1554 and video window 1556 with description 1558, are located in the universal submenu backgrounds subfile 808 of the background graphics file 800. Both sets of backgrounds appear in many menus and are used many times during a sequence of menus.

Figure 56b shows the additional logo graphics information 1508 needed to create the program description submenu. In the preferred embodiment, the "go" logo 1516 can be stored once in memory 620 and directed to the correct portion of the screen in which it is needed for a particular memo. Similar to Figure 55b, the information needed to create the "your choice" logo 1512 and "go" buttons 1516 is stored in the logo graphics file 820.

Figure 56c shows the addition of menu display information 1520 for the program description submenu. Similar to Figure 55c, the information needed for Figure 56c menu display blocks is stored in the menu display blocks' subfile 854 of the menu display and cursor graphics 850. In this particular submenu, there are three menu display blocks of rectangular shape.

Figure 56d shows the addition of cursor highlight overlay information 1526 for the program description submenu. This information is obtained from the cursor highlight overlay submenu 858. For most major menus 1020 and submenus 1050, only one cursor highlight overlay 1526 will appear on the screen at a given time. More cursor highlight overlays 1526 will appear on a screen when the subscriber is presented with more than one question. The number of cursor highlight overlays 1526 will generally correspond with the number of questions being presented to the subscriber on the menu. The cursor highlight overlay 1526 is generally assigned a default position on each menu screen and is moved by the subscriber using either the remote control 900 or the buttons 645 located at the top of the set top terminal 220.

Figure 56e shows the text generation 1530 necessary for the program description submenu for a hit movie. As in Figure 55e, some of the text for the program description submenu is consistently on each program description submenu, such as "PRESS HERE TO RETURN TO CABLE TV." This textual information may be stored locally as opposed to being derived from the STTCIS. Regardless of where the text information is stored, it must be processed through the text generator 621 before being sent to the combiner 624.

Figure 56f shows the addition of video 1560 to the video window 1556. In an alternative embodiment, the video shown in the program description submenu is a still picture. The still picture may be stored in a compressed format (such as JPEG) at the set top terminal 220. These video stills 1560 that are used on program description submenus as well as other menus, may be transmitted by the operations center 202 through the program control information signal from time to time.

In the preferred embodiment, the video window 1556 shows a moving video picture. For the hit movies category, the moving video picture may be obtained directly from a current feed of the described movie. For example, the movie video 1560 shown may be taken directly off of a channel which is currently showing the movie Terminator. The set top terminal 220 would decompress the channel with the movie Terminator and then manipulate the video signal to place it in the video window 1556. This manipulation of the video signal includes scaling

down the size of the video screen and redirecting the video to a portion of the menu screen which is within the video window of the menu.

Another method of getting the moving video to the video window portion of the submenu, is to obtain the video from a split screen channel. This method involves the use of split screen video techniques to send multiple video clips on a single channel at a given time. For example, a channel may be divided into eight portions of screen space and one of the eight positions may carry the Terminator video clip. The set top terminal 220 would decompress the channel and manipulate on the one-eighth portion of the screen desired in the video window of the submenu. The set top terminal 220 would scale the one-eighth picture , if necessary, and redirect it to the correct position on the screen using known scaling and positioning techniques. Additional circuitry may be required in the set top terminal 220 to perform adequate scaling and repositioning.

Figure 56g shows the final product resulting from the combining of Figures 56a through 56f. The combiner 624 integrates each of these portions of information into a single menu screen 1120.

The combiner 624 which displays the menus on the television screen obtains information primarily from three locations, the graphics generator 622, the text generator 621, and the video decompressor 618 (with other video manipulation equipment, if necessary). The graphics generator 622 primarily obtains information from the graphic memory unit 620 but may receive information in the STTCIS. The text generator 621 primarily receives its information from a separate memory for

text. However, in certain embodiments the text information may be stored in the graphics memory 620 or may be taken directly off the STTCIS. The video signal which is sent to the combiner 624 may come directly from one or more video decompressors or ancillary video manipulation equipment.

One of the methods for video clips or promotional video to be sent to the set top terminal 220 is through the use of split screen video techniques. Figure 57a shows the throughput of a single channel using a split screen video technique to divide the channel into four parts. In this manner, four different video clips may be simultaneously sent on a single channel. Program description submenus can acquire one of the video clips shown on the split channel at any given time. Generally, this requires the set top terminal 220 to decompress the entire channel, acquire one-fourth of the video information, scale the video (if necessary), and redirect the video. Using this split screen technique 1602, numerous video clips may be sent over a limited number of channels.

Figure 57b shows an embodiment 1604 in which forty eight different video clips are sent simultaneously on a single channel using split screen video techniques. In this embodiment, the video signal may need to be scaled upwardly to enlarge the picture for viewing in a video window or on a full screen.

In an alternative embodiment, which avoids the need for redirecting video into the portion of the screen which houses the video window 1556, masking and menu graphics are used to cover the portions of the channel video that are not needed. This masking technique allows the split screen video to remain in the

same portion of the screen that it is transmitted by the operations center. The masking then is adjusted to cover the undesired portions of the screen. These masks would be stored in the background graphics file 800 similarly to other background files for menus. The advantage of the system is the cost savings in not needing to redirect video. The disadvantage of the system is that the video window on a description submenu, for example, would not remain in the same location from menu to menu. This inconsistency in video window location detracts from the aesthetically pleasing aspects of the menu layouts.

If the masking technique were used in conjunction with the split screen video shown in Figure 57a, each submenu would have approximately one-quarter screen of video and three-quarter screen of graphic and text information. For example, a submenu or promo menu for a basketball game would mask all but the upper right-hand corner of the screen. Following masking, other background graphics 1550, logo graphics 1508, menu display 1520, cursor graphics 1526, and text information 1530 would be overlayed over the three-quarter mask. In a similar manner, a submenu or promo menu for a hockey game would also have a three-quarter mask. This three-quarter mask would mask all but the lower right-hand corner of the screen. Again, the remaining menu graphics, logos and textual information would overlay the three-quarter mask. As you can see from this example, four different three-quarter masks must be stored in the background graphics file 800 for use in the four possible video window positions.

The split screen video technique may also be used for promoting television programming. Since a great number of short video clips may be sent continuously (such as in Figure 57b), full or partial screen promotionals (or informationals) may be provided to the subscriber. With this large quantity of promotional video, subscribers may be given the opportunity to "graze" through new movie or television programming selections. The subscriber would simply graze from promotional video to promotional video until he found the television program of his liking. Once he has found that program he may choose to order it.

Figures 58a, 58b and 59a, 59b relate to the monthly account review capabilities available to the subscriber. In the preferred embodiment, the subscriber may choose to access the monthly account review capability from both the introductory menu 1000 and home menu 1010. The monthly account review screen shows alternative window types that are available to the set top terminal 220. For example, in the upper left-hand corner of the monthly account review, the current time and date are both shown. The upper right-hand corner provides the subscriber with instructions on how to use the monthly account review capability. Figure 58b also shows that windows may be created in a variety of shapes. For instance, on the lower right-hand part of the screen 1612 two triangularly shaped windows with messages are shown. In addition, on the left lower part of the screen 1612 a window in the shape of a trapezoid is shown with a textual message inside.

The monthly account review provides a list of charges from the first day of the month to the date of viewing for each major menu. Charges are incurred on a pay-per-view basis and on a subscription basis (weekly, monthly, quarterly, etc.). At the lower part of the screen, the total of the charges incurred for the month is listed. The account status can also be calculated on a weekly, quarterly or semi-annual basis.

If the user moves his cursor to highlight one of the eight menus listed and depresses the "go" button, he will obtain further billing information on the menu. Figures 58a and 58b show in screens 1610 and 1612, respectively, the subscriber selecting menu A for further information.

Figures 59a and 59b are submenus for the monthly account review and displays detailed billing information about selections made on menu A. The date of each movie selection, title of the movie, and price for each movie is displayed (1614, 1616). Also, any discounts which have been granted are displayed. The total charges on this menu and the day in which the menu will be changed are shown in the lower part of the screen. From this submenu, the subscriber may either return to regular TV or return to the major menu for the monthly account review. If the submenu information does not fit on a single screen, an extended submenu may be utilized with follow on extension screens. Alternatively, a scrolling feature may be used enabling the subscriber to scroll additional information onto the first submenu screen.

The account information necessary to create the monthly account review menus may be stored either in the memory of the set top terminal 220 or at a remote location that communicates with the set top terminal 220. In the simplest embodiment, the set top terminal 220 records a subscriber's selections locally and calculates the monthly account review based upon the subscriber's selections which require the payment of fees. This monthly account information is stored locally and sent to the cable headend 208 at least once a month for back-up and billing purposes.

Alternatively, the subscriber's viewing selections and billing information may be continuously maintained at the cable headend 208 or a remote site connected via communication lines to the cable headend 208. The cable headend 208 or the remote site must regularly transmit the monthly account information to the set top terminal 220. Each embodiment has advantages and disadvantages. If the account information and processing is done locally at the set top terminal 220, each set top terminal 220 must be provided with the memory and necessary processing capability to maintain the account. This greatly increases the cost of a set top terminal 220. If the account information is maintained remotely, the remote site must remain in regular contact with the set top terminal 220 in order to provide the subscriber with billing information.

To accommodate homes with multiple viewers two or more set top terminals 220 may be placed on a single bill or two accounts may be created for one set top terminal 220.

Figure 60 shows an example of remote statistical and billing sites. In this arrangement, statistical and billing information from a community of set top terminals 1720 is communicated through cable headend 208 sites to regional statistical and billing sites 1730 (SBS). A regional SBS may serve several cable headend 208 sites. The regional SBS 1730 calculates billing and statistical information and passes necessary billing information back downstream through the network controller at the cable headend 208 to an appropriate single set top terminal 220 in a subscriber's home. In addition, the regional SBS communicates the billing and statistical information received on program viewer choices to the central SBS 1740.

The central SBS 1740 accumulates the data received from a number of regional statistical and billing sites and calculates national statistical and billing information. In the preferred embodiment the regional SBS 1730 prints and mails bills to subscribers. The central SBS 1740 can calculate program ratings, shares and HUTS (homes using televisions) for the nation and by region. With interactive TV programs sophisticated statistical information may be gathered through the network controllers of the cable headends.

This arrangement for billing and statistical information provides the operators of the system with the advantages of distributive processing. Remote billing sites may serve regions of the country by having each cable headend 208 in a region of the country connected to one regional billing site. The information from the regional billing sites may then be communicated on a less frequent basis to the

operations center or a central billing location. This method of distributed processing of billing enables the central billing location to receive fewer communications and be more efficient. In addition, the communication links between the cable headend's network controller 214 and regional sites will be of shorter distance than communication links to the operations center from the cable headends 208. This should result in a cost savings to the system operator.

However, the regional statistical and billing may be eliminated and all communications from the cable headend 208 may proceed to the Central SBS 1740. In fact, the Central SBS 1740 can be collocated with the Operations Center 202 and all functions performed at one central location.

If the cable program packaging and delivery system 202 is established in just one locale, the network controller 214 can perform all the statistical and billing procedures.

Figures 61 through 89 are additional representative menus which include color indications.

Figures 90 through 98 demonstrate the generation of menu screens.

Figure 99 is an example of a help menu which may be accessed from the introductory menu. In alternative embodiments, help or instruction menus may be accessed from any displayed menu. Figure 99 instructs the subscriber on the use of the subscriber interface (remote control unit 900). In particular, Figure 99 instructs the subscriber on the use of arrow buttons for cursor movement. Figure 99 also shows how additional instructional information can be provided with follow-

on menus by depressing "go" in the lower portion of the screen (highlighted in yellow).

Figure 100 is an exemplary introductory menu with access to remote instructions.

Figures 101 through 131 are additional representative menus which include color indications.

Figures 132 through 134 demonstrate the generation of menu screens.

What is claimed is:

1. A television program delivery and program selection system comprising:

an operations center comprising:

a means for packaging a plurality of television programs; and

a means for generating program control information including data on the packaging of the television programs;

a means for delivering the packaged television programs and the program control information from the operations center to a subscriber; and,

a means for selecting at least one of the delivered packaged television programs for display on a television, wherein the selecting means is at the subscriber's location and comprises:

an electronic memory for storing computer program instructions;

a processor for sequencing through the computer program instructions and for converting the program control information into menus to be displayed on the television utilizing the sequenced computer program instructions; and

a subscriber interface for choosing an option from the displayed menu and for effecting the sequencing of the computer program instructions.

2. The system of claim 1, wherein the packaged television programs are grouped by program category with each category being accessible by choosing its corresponding option from the displayed menu.

3. The system of claim 1, wherein the displayed menus are multi-leveled so that the options chosen using the subscriber interface may be used to display another menu.

4. The system of claim 1, wherein each of the displayed menus are segmented, allowing simultaneous display of current time, message text and program selection options.

5. A menu-driven television program selection system comprising:

an operations center comprising:

a means for packaging a plurality of television programs; and

a means for assembling program control information, wherein the assembled program control information includes programming data on the packaging of the television programs;

a control unit comprising a means for receiving and processing program selection activity data from a plurality of subscriber locations;

a means for transporting the packaged television programs and the program control information to each of the subscriber locations; and

a signal processing unit at the subscriber location comprising:

a means for receiving the packaged television programs and the program control information from the transport means;

a means for selecting television programs, from the received packaged television programs for display on a television, using the received program control information, comprising:

an electronic memory for storing computer program instructions;

a processor for sequencing through the computer program instructions and for transforming the program control information into menus to be displayed on the television utilizing the sequenced computer program instructions; and

a subscriber interface for choosing an option from the displayed menu and for effecting the sequencing of the computer program instructions;

a means for generating the program selection activity data based on the instructions sequenced by the computer program; and

a means for reporting the program selection activity data to the control unit.

6. The selection system of claim 5, wherein the packaged television programs are grouped by program category with each category being accessible by choosing its corresponding option from the displayed menu.

7. The selection system of claim 5, wherein the displayed menus are multi-leveled so that the options chosen from the user interface may be used to display another menu.

8. The selection system of claim 5, wherein the program selection activity reported to the control unit is used to generate and maintain subscriber's account and billing information.

9. The selection system of claim 8, wherein the account and billing information is calculated on a per-view basis.

10. The selection system of claim 8, wherein the account and billing information is calculated on a monthly basis.

11. A method for delivery and menu-driven selection of television programs comprising the steps of:

packaging television programs;

assembling program control information based on the packaging of the television programs;

delivering the packaged television programs and the program control information to a subscriber;

selecting a television program from the packaged television programs to be displayed on a television comprising the steps of:

accessing stored computer program instructions;

sequencing instructions within the stored computer program;

transforming said program control information into menus to be displayed on the television using the sequenced instructions;

displaying an introductory menu on the television;

choosing an option from the displayed introductory menu using a subscriber interface;

displaying a home menu on the television;

choosing an option from the displayed home menu using the subscriber interface; and,

determining whether a television program has been selected or a different menu should be displayed; and,

displaying selected television program.

12. The method of claim 11, wherein the step of packaging television programs comprises grouping the programs by category so that each category is accessible by choosing its corresponding option from the displayed menu using the subscriber interface.

13. The method of claim 11, wherein each of the displayed menus are segmented, allowing simultaneous display of current time, message text and program selection options.

14. The method of claim 11, wherein the step of delivering the packaged television programs and the program control information to a subscriber comprises digitally compressing the signals carrying the packaged television programs and the program control information.

15. A method for delivery, control and menu-driven selection of cable television programs comprising the steps of:

packaging cable television programs using a control unit;

assembling program control information using the control unit;

delivering the packaged programs and the program control information to a subscriber, comprising:

compressing the packaged programs; and

utilizing cable transmission media;

selecting a television program from said packaged television programs comprising the steps of:

accessing a stored computer program;

sequencing instructions within the stored computer program;

transforming said program control information into menus to be displayed on a television using the sequenced instructions;

displaying an introductory menu on the television;

choosing an option from the displayed introductory menu using a subscriber interface;

displaying a home menu on said television; and

choosing an option from the displayed home menu using the subscriber interface;

determining whether to display the selected television program or to display a different menu; and

maintaining a program selection account and billing information for each subscriber using the control unit comprising the steps of:

creating a program selection activity report at the subscriber's location;

storing the program selection activity report in electronic memory; and

sending said program selection activity report from the subscriber's location to the control unit.

16. The method of claim 15, wherein the step of packaging television programs comprises grouping the programs by category so that each category is accessible by choosing its corresponding option from the displayed menu using the subscriber interface.

17. The method of claim 15, wherein the selection of a television program from said packaged television programs further comprises displaying a major menu and wherein the option chosen from the displayed menu determines which major menu is displayed.

18. The method of claim 15 wherein the step of determining whether to display the selected television program or to display a different menu is based on access privileges or authorization codes.

19. The method of claim 15, wherein the program selection account and billing information is calculated on a per-view basis.

20. The method of claim 15, wherein the program selection account and billing information is calculated on a monthly basis.

21. A menu-driven cable television selection system with multiple subscribers comprising:

an operations center comprising:

a means for packaging a plurality of television programs wherein the packaged television programs are grouped by program category; and

a means for assembling program control information, wherein the assembled program control information includes programming data on the packaging of the television programs;

a means for transporting the packaged television programs and the program control information to each of the subscriber locations, comprising:

a cable television transmission media; and

a means for compressing the packaged television programs;

a signal processing unit at the subscriber location comprising:

a means for receiving the packaged television programs and the program control information from the transport means;

a means for selecting television programs, from the received packaged television programs for display on a television, using the received program control information, comprising:

an electronic memory for storing computer program instructions;

a processor for sequencing through the computer program instructions and for transforming the program control information into menus to be displayed on the television utilizing the sequenced computer program instructions; and

a subscriber interface for choosing an option from the displayed menu and for effecting the sequencing of the computer program instructions wherein each program category is accessed by choosing its corresponding option from the displayed menu;

a means for generating the program selection activity data based on the instructions sequenced by the computer program; and

a means for reporting the program selection activity data to a control unit; and

a control unit comprising:

a means for receiving and processing program selection activity data from a plurality of subscriber locations; and

a means for generating and maintaining subscriber's account and billing information.

22. The program selection system of claim 21, wherein the displayed menus are multi-leveled so that the options chosen from the user interface may be used to display another menu.

23. The program selection system as claimed in claim 21, wherein the account and billing information is calculated on a per-view basis.

24. The program selection system as claimed in claim 21, wherein the account and billing information is calculated on a monthly basis.

25. The program selection system of claim 21, wherein the control unit further comprises means for determining program ratings based on program selection activity.

26. A menu-driven cable television selection system with multiple subscribers comprising:

an operations center comprising:

a means for packaging a plurality of television programs wherein the packaged television programs are grouped by program category; and

a means for assembling program control information, wherein the assembled program control information includes programming data on the packaging of the television programs;

a means for transporting the packaged television programs and the program control information to each of the subscriber locations, comprising:

a cable television transmission media; and

a means for compressing the packaged television programs;

a signal processing unit at the subscriber location comprising:

a means for receiving the packaged television programs and the program control information from the transport means;

a means for selecting television programs, from the received packaged television programs for display on a television, using the received program control information, comprising:

an electronic memory for storing computer program instructions;

a processor for sequencing through the computer program instructions and for transforming the program control information into menus to be displayed on the television utilizing the sequenced computer program instructions; and

a subscriber interface for choosing an option from the displayed menu and for effecting the sequencing of the computer

program instructions wherein each program category is accessed by choosing its corresponding option from the displayed menu;

a means for generating the program selection activity data based on the instructions sequenced by the computer program; and

a means for reporting the program selection activity data to a control unit; and

a control unit comprising:

a means for receiving and processing program selection activity data from a plurality of subscriber locations.

27. A television program delivery and program selection system comprising:

an operations center comprising:

a means for packaging a plurality of television programs; and

a means for generating program control information including data on the packaging of the television programs;

a means for delivering the packaged television programs and the program control information from the operations center to a subscriber; and,

a means for selecting at least one of the delivered packaged television programs for display on a television, wherein the selecting means is at the subscriber's location and comprises:

a microprocessor for executing program instructions;

a graphic memory;

a graphic generator to generate graphics from the graphic memory; and

a subscriber interface for choosing an option from displayed graphics and for effecting the memory location from which graphical information is generated by the graphics generator.

28. A system to provide a subscriber menu selection of television programming from a plurality of individual menus comprising:

means for digitally compressing a plurality of analog and digital television program signals;

means for packaging each of the digitally compressed signals with program control information relating to the program identification and menu identification;

means for transmitting the packaged signal to a signal processor for further transmission;

terminal receiving means associated with the television receiver comprising means for displaying menus based on the program control information; and

user interface means for user selection of any one of the plurality of television programs using one or more of the displayed menus.

29. The system of claim 28, further comprising a network controller for adding additional program information or modifying the program control information.

30. The system of claim 28, further comprising a local transmitting means for transmitting between the signal processor and the terminal receiving means.

31. The system of claim 28, further comprising local transmitting means for transmitting compressed video between the signal processor and terminal receiving means.

32. The system of claim 28, further comprising local transmitting means for transmitting compressed video and analog between the signal processor and terminal receiving means.

33. The system of claim 28, further comprising local transmitting means for transmitting compressed video and digital audio between the signal processor and the terminal receiving means.

34. The system of claim 28, wherein the means for displaying menus further comprises a means for generating menus.

35. The system of claim 28, wherein the user interface means further comprises a remote control.

36. The system of claim 28 wherein the means for displaying menus further comprises a means for displaying a sequence of menus and wherein the user may select with the user interface means one of the plurality of television programs by making a selection from each of the sequential menus.

37. A system for providing television programming on demand substantially as shown and described.

38. A method for providing menu selection of television programming from a plurality of individual menus to a subscriber comprising the steps of:

converting the programs into a standard digital format;

manual entry of programming information;

packaging of television programs;

assembling the program control information based on the packaging of the television programs;

transmitting the packaged television programs and program control information to a signal processor;

delivering packaged television programs and program control information to a set top terminal;

generating menus using the set top terminal hardware and the program control information;

displaying menus; and

selecting a television program using one or more menus.

39. A method for providing programming on demand substantially as shown and described.

40. A system for delivering menu selectable programming to a subscriber comprising:

means for converting programming to digital format;

means for packaging each of the digital format programs;

means for deriving program control information based on the packaging of the digital format programs;

means for transmitting the packaged programs and program control information;

a signal processor for receiving the packaged programs and program control information and retransmitting the packaged programs and program control information; and

terminal receiving means associated with a television comprising:

means for receiving the retransmitted packaged programs and program control information;

means for displaying individual menus based on the program control information; and

subscriber interface means for subscriber selection of any one of the digital formatted programs using one or more of the displayed menus.

41. A system to provide a subscriber menu selection of television programming from a plurality of individual menus comprising:

at least one operations center comprising:

means for digitally compressing a plurality of analog and digital television program signals;

at least one computer assisted packaging system comprising:

a packager console for entering information related to the packaging of programs;

means for packaging each of the digitally compressed signals with program control information relating to the program identification and menu identification;

at least one means for receiving external program signals; and

a means for storing cable franchise configuration information;

at least one uplink site comprising;

means for modulating the signal;

means for transmitting the packaged signal to a satellite transponder;

at least one satellite transponder;

a signal processor for receiving the packaged signal from the satellite transponder and retransmitting the packaged signal;

terminal receiving means associated with the television receiver comprising:

means for tuning the signal;

means for displaying menus based on the program control information; and

user interface means for user selection of any one of the plurality of television programs using one or more of the displayed menus.

42. The system of claim 41 wherein there are two operations centers, a master operations center and a slave operations center.

43. The system of claim 41 wherein there are two uplink sites, a master uplink site and a slave uplink site.

44. The system of claim 41 wherein two program priority levels are used, and wherein the satellite transponder comprises two transponders, a priority one transponder and a priority two transponder.

45. An operations center for use with a television program delivery system with menu selection of television programs from a plurality of individual menus, using

a distribution center for distributing programs and program control information to subscribers, each subscriber having a terminal, some television programs coming from external sources, comprising:

means for receiving television programs from external sources;

means for converting programs to a digital format;

means for generating menu configurations;

means for generating program control information based upon menu configurations;

means for packaging the digital format programs using the program control information;

means for compressing the packaged program information;

means for compressing the program control information;

means for combining the compressed packaged programs and compressed program control information into a combined signal for transmission; and

means for transmitting the combined signal.

46. The operations center of claim 45, further comprising means for locally storing programs.

47. The operations center of claim 45, further comprising cable franchise configuration information storage.

48. The operations center of claim 45, further comprising means for generating cable franchise control information.

49. The operations center of claim 45 wherein the means for generating menu configurations comprises at least one packager console for manual entry of packaging information.

50. A method for packaging and delivering television programs and television program control information to subscribers in a menu-driven television program selection system, some television programs coming from external sources, comprising the steps of:

receiving programs from external sources;

converting programs to a digital format;

generating menu configurations;

generating program control information using the menu configurations;

grouping the television programs into packages using the generated program control information;

combining packaged programs and program control information;

compressing program information;

compressing program control information; and

transmitting compressed packaged programs and control information.

51. A method for packaging and delivering television programs and television program control information to subscribers in a menu-driven television program selection system, some television programs coming from internal sources, comprising the steps of:

receiving programs from internal sources;

converting programs to a digital format;

generating menu configurations;

generating program control information;

packaging programs using the generated program control information;

combining packaged programs and program control information;

compressing program information;

compressing program control information; and

transmitting compressed packaged programs and control information.

52. The method of claim 51, further comprising the step of storing cable franchise configuration information.

53. The method of claim 51, further comprising means for generating cable franchise control information.

54. A network controller substantially as shown and described.

55. A signal processor for a menu-driven television and audio program selection system where programs are packaged and combined with a program information signal to form a combined signal, the system including a subscriber interface, comprising:

means for receiving a combined signal;

computer equipment comprising:

means for communicating with interface equipment that allows manual entry of information;

means for allowing modification of the combined signal; and

means for adding digitally compressed information to the combined signal;

means for transmitting the signal to the subscriber interface.

56. A menu-driven selection system for subscriber selection of television programs where there are two priority levels of subscribers, priority one and priority two, and the priority two level subscribers receive more television programs than the priority one television subscribers, comprising:

means for generating a priority one program control information signal;

means for generating a priority two program control information signal;

means for packaging priority one and priority two television programs using the priority one and priority two program control information signals;

means for combining the priority one television programming and the priority one program control information signal;

means for combining the priority two television programs and the priority two television program control information signal;

priority one transmitting means for transmitting the combined priority one television programs and priority one program control information;

priority two transmitting means for transmitting the priority two television programs and priority two program control information;

a signal processor for receiving priority one programs and control information;

a signal processor for receiving priority one and priority two programs and control information; and

a plurality of set top terminals which may be programmed to receive either priority one or priority two television program and control information comprising:

means for displaying menus based on program control information; and

a subscriber interface means for subscriber selection of a priority one or priority two television programs using one or more displayed menus.

57. A system for providing television programming with different priority levels for different bandwidths substantially as shown and described.

58. A system for providing television programming with different levels of programming access for the same subscriber substantially as shown and described.

59. A system for providing television programming with dynamic bandwidth allocation, for dynamically changing the allocation of bandwidths for different groups of programming, substantially as shown and described.

60. A system for providing television programming with dynamic menu allocation for changing programming menus substantially as shown and described.

61. A system for providing television programming with dynamic bandwidth allocation for changing the allocation of bandwidth for different groups of programming and with dynamic menu allocation for changing programming menus substantially as shown and described.

62. A system to provide a subscriber menu selection of television and audio programming from a plurality of individual menus comprising:

a means for packaging compressed television and audio programming into a packaged signal;

a means for generating a program control information signal;

a means for combining the packaged signal and program control information signal into a combined signal;

a means for transmitting the combined signal;

a decompression box for processing the combined signal comprising:

a means for receiving the transmitted combined signal;

a tuner;

a decompressor;

a processor;

an expansion port comprising:

at least one transmission means for carrying decompressed video information; and

at least one transmission means for carrying control information; and

an upgrade module coupled to the expansion port, comprising:

means for processing the program control information signal;

means for generating video signals for menus; and

subscriber interface means for menu selection.

63. An upgrade module for enhancing the functionality of a simple decompression box for use with a program delivery system with menu selection of programs from a plurality of individual menus, each subscriber having a simple decompression box, comprising:

a means for demultiplexing a program control information system into at least two components, graphics and text;

a graphics memory for storing graphical information;

a graphics decompressor; and

a combiner for combining graphics and text, thereby generating a menu.

64. An upgradeable system to provide a subscriber menu selection of video and audio programming from a plurality of individual menus, comprising:

means for packaging video and audio programs;

means for generating a program control information signal;

means for combining the packaged video and audio programs with the program control information signal into a combined signal;

means for digitally compressing the combined signal into a digitally compressed signal;

means for transmitting the digitally compressed signal to a terminal;

terminal means for receiving and processing the digitally compressed signal comprising:

means for generating individual menus;

a port for coupling upgrade hardware; and

at least one processor.

65. The upgradeable system of claim 64 wherein the port comprises at least a four pin connection for connecting an upgrade cable with four or more wires.

66. The upgradeable system of claim 64 further comprising a hardware upgrade, coupled to the port of the terminal, comprising a two-way communications system.

67. The upgradeable system of claim 64 further comprising a hardware upgrade, coupled to the port of the terminal, comprising a compact disk player.

68. The upgradeable system of claim 64 further comprising a hardware upgrade, coupled to the port of the terminal, comprising a decompressor and audio output.

69. The upgradeable system of claim 64 further comprising a hardware upgrade, coupled to the port of the terminal by a cable, comprising

a means for storing downloadable data; and

a viewing means for viewing the downloadable data.

70. A set top terminal for use with a program delivery system with menu selection of programs from a plurality of individual menus, using a program control information signal with program identification and menu identification comprising:

at least one tuner;

at least one demultiplexer;

at least one decryptor;

at least one video decompressor;

at least one instruction memory for the microprocessor;

at least one microprocessor;

at least one menu memory;

at least one means for generating a menu from the menu memory; and

at least one means for signaling the microprocessor to prompt the menu generator to generate a menu for display.

71. A set top terminal for use with a program delivery system with menu selection of programs from a plurality of individual menus, using a program control information signal with program identification and menu identification, the menus including an introductory menu, a home menu, major menus, submenus, and during program menus comprising:

a tuner;

a demultiplexer coupled to the tuner;

a digital video decompressor coupled to the demultiplexer;

an electronic memory which stores executable instructions;

means for generating an introductory menu, a home menu, and at least one major menu, submenu and during program menu;

means for sequencing between the introductory menu, home menu, major menus, and submenus; and

means for selecting a program from a submenu.

72. A method for generating menu displays with a set top terminal for use with the program delivery system with menu selection of programs from a plurality of individual menus, using executable instructions stored in memory, comprising the steps of:

generating graphics comprising the steps of:

fetching background graphic files and decompressing background graphics files;

fetching logo graphics files and decompressing logo graphics files; and

fetching menu display and cursor graphic files and decompressing the menu display and cursor graphics files;

generating text comprising:

fetching long term text files and generating the long term text;

fetching intermediate term text files and generating the intermediate term text files; and

fetching short term text files and generating the short term text files;

combining the decompressed graphics files and the generated text files; and

displaying the combined graphics and text files as a menu.

73. The menu generation method of claim 72, wherein a video channel is used, further comprising the step of combining video, comprising the steps of:

selecting a video channel;

decompressing the video channel;

scaling the video to change its size; and

redirecting the video to change its location.

74. The menu generation method of claim 72 further comprising still video picture generation comprising the steps of:

fetching a still video picture stored in memory;

decompressing the still video picture; and

sending the decompressed still video picture to the combiner.

75. A method for generating a menu with video for use with a set top terminal in a program delivery system with menu selection of programs from a plurality of individual menus, using a program signal with a split screen video channel, comprising the steps of:

selecting a split screen video channel on the program signal;

decompressing the split screen channel of the program signal;

determining the desired portion of video on the split screen channel;

masking all the portions of the split screen channel which are not selected;

overlaying the mask on the split screen video channel;

overlaying menu graphic information on the masking;

overlaying text information on the graphics and masking; and

displaying the generated menu.

76. A method of sequencing menus on a television screen for selecting television programs in a program delivery system with set top terminal menu generation, where the set top terminal receives packaged television programs including program control information, the menus generated by the set top terminal including an introductory menu, a home menu, a major menu, a submenu, and overlay menu and a hidden menu, comprising the steps of:

determining if a packaged program signal is being received by the set top terminal;

generating and displaying an introductory menu;

awaiting subscriber key entry;

determining whether to decompress a packaged video signal or display a menu;

generating and displaying a home menu;

generating and displaying a major menu;

generating and displaying a submenu for a subcategory;

generating and displaying a program list submenu;

generating and displaying a program description submenu;

generating and displaying a confirmation submenu to confirm packaged program selected;

decompressing selected packaged program video;

displaying decompressed video;

generating and displaying overlay menu in addition to decompressed video; and

executing hidden menu software at microprocessor during display of video.

77. The method of claim 76 wherein the step of generating and displaying of an introductory menu further comprises the steps of:

fetching the universal background graphics file for the introductory menu;

decompressing the fetched universal background file to create the menu background;

fetching the logos graphics file for the introductory menu;

decompressing the fetched logos graphics file to create logos; and

combining the menu background and logos.

78. The method of claim 76 wherein the step of generating and displaying a major menu comprises:

fetching the universal background graphics file for an upper sash;

fetching the universal background graphics file for a lower sash;

decompressing the fetched universal background files to create the major menu background;

fetching the network logo graphics file for the major menu;

fetching other logo graphics files for the major menu;

decompressing the fetched logos graphics files to create the major menu logos;

combining the major menu background and major menu logos;

fetching the cursor highlight graphics file;

decompressing the cursor highlights graphics file to create the cursor highlights; and

combining the cursor highlights with the major menu background and the major menu logos.

79. The method of claim 76 further comprising the steps of:

fetching a major menu icon graphics file from memory; and

decompressing the major menu icon graphics file to create a major menu icon.

80. A method of sequencing menus on a television screen for selecting television programs in a program delivery system with set top terminal menu generation, where the set top terminal receives packaged television programs including program control information, the menus generated by the set top terminal including an introductory menu, a home menu, a major menu, a submenu, and an overlay menu, comprising the steps of:

determining if a packaged program signal is being received by the set top terminal;

generating and displaying an introductory menu;

awaiting subscriber key entry;

determining whether to decompress a packaged video signal or display a menu;

generating and displaying a home menu;

generating and displaying a major menu;

generating and displaying a submenu for a subcategory;

generating and displaying a program list submenu;

generating and displaying a program description submenu;

generating and displaying a confirmation submenu confirming selection of a packaged program;

decompress selected packaged program video;

decompress selected packaged program audio;

generating overlay menu;

combining decompressed video and overlay menu in a combiner;

displaying combined video and overlay menu.

81. A remote control unit for use with a set-top terminal, the set-top terminal capable of receiving a plurality of digitally compressed television signals and generating a plurality of menus corresponding to the digitally compressed signals, each menu corresponding to a group of related programs or a single program, the remote control unit comprising:

means, within the remote control unit, for communicating with the set-top terminal to allow selection of a desired program by a user from the plurality of menus; and,

a plurality of switches, coupled to the means for communicating, the plurality of switches including menu select switches and cursor movement switches, the cursor movement switches being capable of causing a cursor to move on a menu;

the menu select switches being capable of selecting a desired menu from the plurality of menus, the menu switches having icons representing the groups of related television signals;

the cursor movement switches located substantially at the center of mass of the remote control unit, and each cursor movement switch having an angled surface;

whereby a user's thumb may easily access and depress a cursor movement switch or menu select switch and distinguish the cursor movement switches and menu select switches from the remainder of the plurality of switches without looking at the remote control unit.

82. The remote control unit of claim 81 wherein the plurality of switches includes two groups of switches, a standard group including the volume control and channel select switches, and a special group including the cursor movement switches and menu select switches, whereby the two groups of switches are physically separated from each other on the remote control unit by a line at or above the center of mass of the remote control unit.

83. The remote control unit of claim 81 further comprising a joystick for cursor movement.

84. The remote control unit of claim 81 further comprising a ball for cursor movement.

85. The remote control unit of claim 81 further comprising a rolling-depressible button for cursor movement.

86. An interface system for a subscriber to interface with a video and audio programming delivery system, transmitting a digitally compressed signal, and select programs using menus, comprising:

a set top terminal unit comprising:

a means for receiving the digitally compressed signal;

a means for decompressing the digitally compressed signal into a decompressed signal;

a means for generating menus from the decompressed signals;

a means for receiving button depressions;

a means for effecting the execution order of program instructions using the button depression signals; and

a means for sequencing through the menus;

a portable remote control unit for accepting subscriber entries comprising:

a plurality of buttons comprising:

cursor movement buttons; and

menu buttons; and

a means for communicating button depressions to the set top terminal.

87. A digital audio program delivery and program selection system for use with a television, with menu selection of digital audio programs from a plurality of individual menus, each subscriber having a terminal, comprising:

means for generating menu configurations for digital audio programs;

means for packaging the digital audio programs using the menu configurations;

means for compressing the packaged programs;

means for compressing the menu configurations;

means for combining the compressed packaged programs and compressed menu configurations into a combined signal for transmission;

means for transmitting the combined signal; and

terminal receiving means associated with a television comprising:

means for receiving the combined signal;

means for displaying individual menus based on the menu configurations;

subscriber interface means for subscriber selection of any one of the digital audio programs using one or more of the displayed menus; and

means for decompressing the selected digital audio program.

88. The system of claim 87, wherein the terminal receiving means further comprises means for selecting a digital audio program using only subscriber interface buttons located on the subscriber interface, wherein the digital audio program may be selected directly without the use of displayed menus.

89. A system for delivering menu selectable programming to a subscriber and suggesting certain of those programs for viewing by the subscriber, using menus, comprising:

means for converting programming to digital format;

means for generating program control information;

means for packaging the digital format programs using the program control information;

means for combining and compressing the packaged programs and program control information into a combined signal;

means for transmitting the combined signal;

a terminal associated with the television comprising:

means for receiving the combined signal;

means for creating and storing personal profile information;

means for generating menus;

means for gathering viewer mood information using menus;

means for selecting at least one program for suggestion to the viewer; and

means for displaying the suggested program to the viewer.

90. The system of claim 89, wherein the terminal further comprises:

a means for combining personal profile information and viewer mood information into selection criteria;

a means for comparing the selection criteria and the program control information; and

a means for matching the selection criteria with one or more programs described by the program control information.

91. A system to provide a subscriber interactive services with a remotely located computer using a series of individual menus, comprising:

means for generating menu control information in digitally compressed form;

means for transmitting the digitally compressed menu control information;

a television terminal for displaying menus on a television comprising:

a decompressor for decompressing the menu control information;

a menu generator for generating menus from the menu control information;

a means for interactively entering information using generated menus;

means for communicating with the remotely located computer;

means for receiving data from the remotely located computer; and

means for integrating the data into menus.

ABSTRACT

An expanded television program delivery system is disclosed which allows viewers to select television and audio program choices from a series of menus. Menus are partially stored in a set top terminal in each subscriber's home. The menus may be reprogrammed by signals sent from a headend or from a central operations center. The system allows for a great number of television signals to be transmitted by using digital compression techniques. An operations center with computer-assisted packaging allows various television, audio and data signals to be combined, compressed and multiplexed into signals transmitted on various channels to a cable headend which distributes the signals to individual set top terminals. Various types of menus may be used and the menus may incorporate information included within the video/data signal received by the set top terminal. A remote control unit with icon buttons allows a subscriber to select programs based upon a series of major menus, submenus, and during program menus. Various billing and statistics gathering methods for the program delivery system are also disclosed.

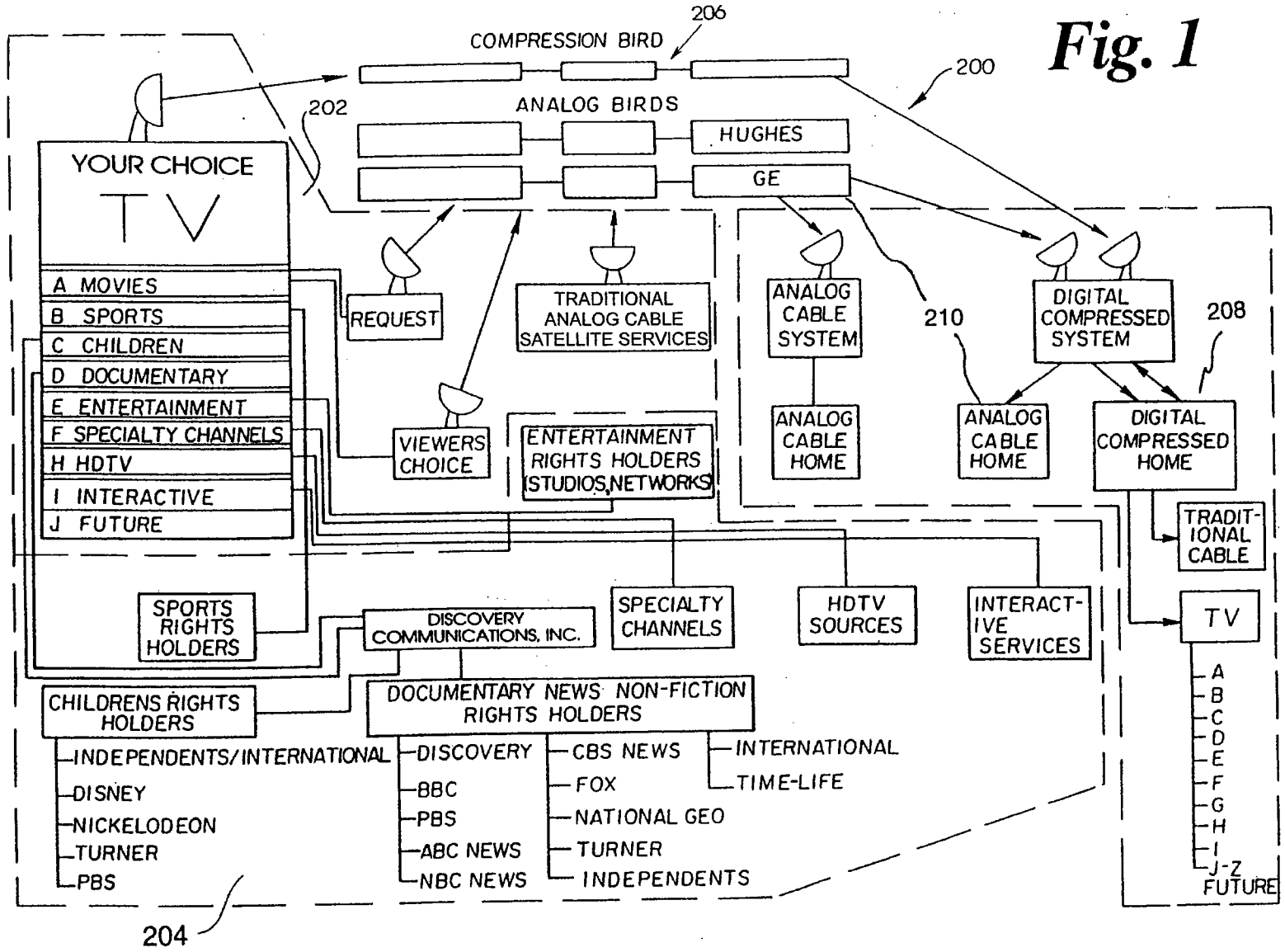

206
COMPRESSION BIRD
200
202
ANALOG BIRDS
HUGHES
GE
YOUR CHOICE TV
A MOVIES
B SPORTS
C CHILDREN
D DOCUMENTARY
E ENTERTAINMENT
F SPECIALTY CHANNELS
H HDTV
I INTERACTIVE
J FUTURE
REQUEST
TRADITIONAL ANALOG CABLE SATELLITE SERVICES
ANALOG CABLE SYSTEM
210
DIGITAL COMPRESSED SYSTEM
208
VIEWERS CHOICE
ENTERTAINMENT RIGHTS HOLDERS (STUDIOS,NETWORKS)
ANALOG CABLE HOME
ANALOG CABLE HOME
DIGITAL COMPRESSED HOME
TRADIT-IONAL CABLE
TV
SPORTS RIGHTS HOLDERS
DISCOVERY COMMUNICATIONS, INC.
SPECIALTY CHANNELS
HDTV SOURCES
INTERACT-IVE SERVICES
CHILDRENS RIGHTS HOLDERS
DOCUMENTARY NEWS NON-FICTION RIGHTS HOLDERS
INDEPENDENTS/INTERNATIONAL
DISNEY
NICKELODEON
TURNER
PBS
DISCOVERY
BBC
PBS
ABC NEWS
NBC NEWS
CBS NEWS
FOX
NATIONAL GEO
TURNER
INDEPENDENTS
INTERNATIONAL
TIME-LIFE
A
B
C
D
E
F
G
H
I
J-Z
FUTURE
204

Fig. 1

Fig. 2

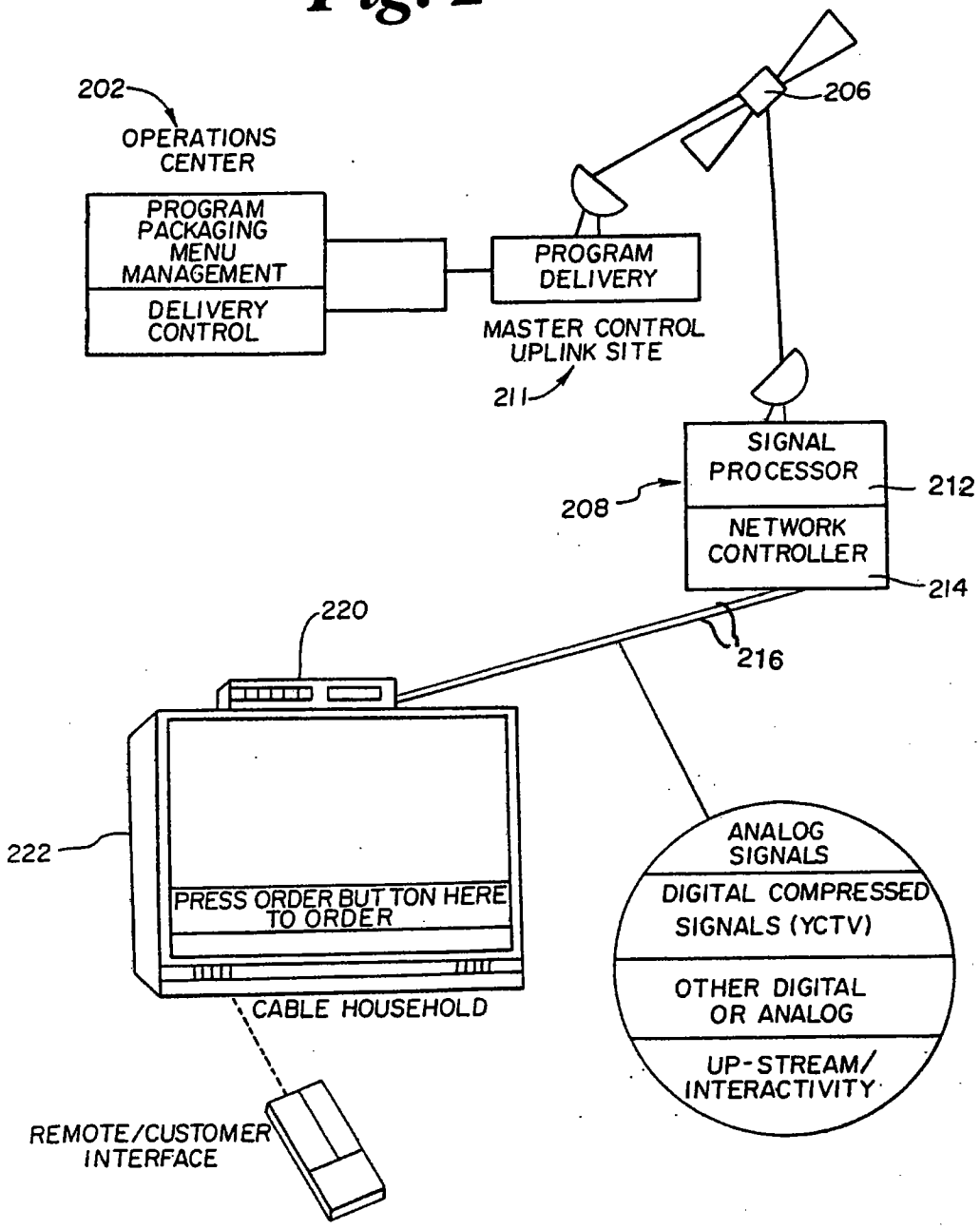

202
OPERATIONS CENTER
PROGRAM PACKAGING MENU MANAGEMENT
DELIVERY CONTROL
PROGRAM DELIVERY
MASTER CONTROL UPLINK SITE
211
206
SIGNAL PROCESSOR
212
208
NETWORK CONTROLLER
214
216
220
222
PRESS ORDER BUTTON HERE TO ORDER
CABLE HOUSEHOLD
REMOTE/CUSTOMER INTERFACE
ANALOG SIGNALS
DIGITAL COMPRESSED SIGNALS (YCTV)
OTHER DIGITAL OR ANALOG
UP-STREAM/ INTERACTIVITY

Fig. 3a

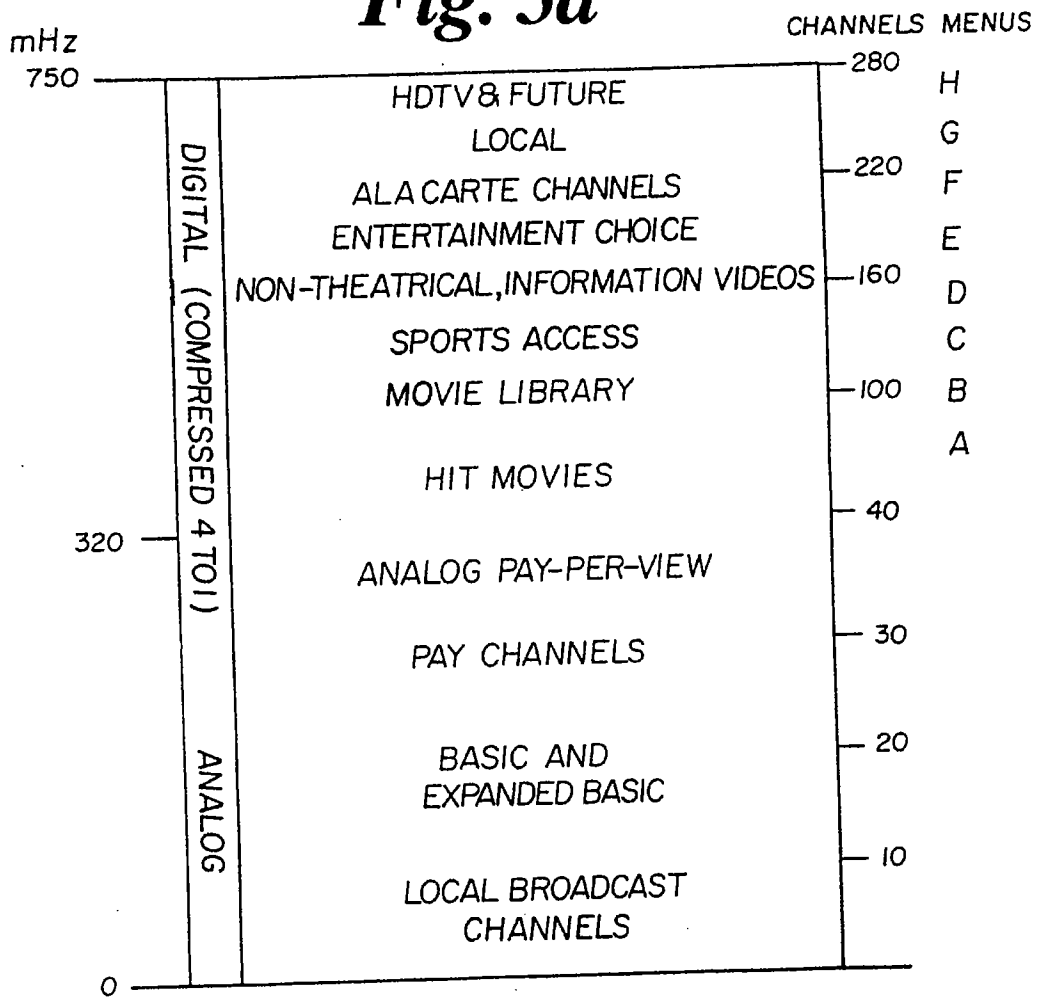
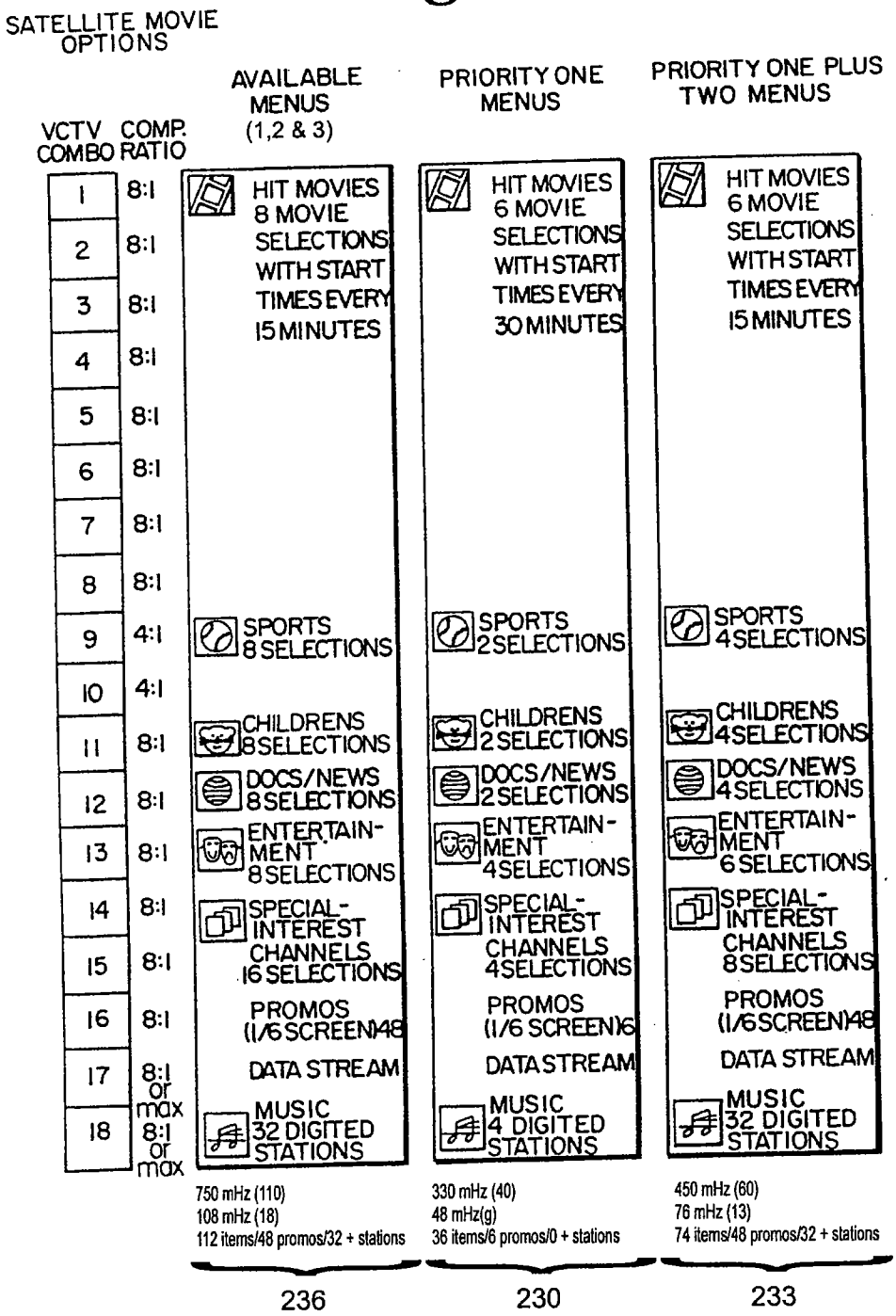


Fig. 3b

230

CHANNEL MENU	PROGRAMMING CATEGORY	#CHANNELS ALLOCATED
A	MOVIES	50
B	SPORTS	2
C	CHILDRENS	3
D	DOCUMENTARY	14
E	ENTERTAINMENT	10
F	SPECIALTY CHANNELS	15
G	LOCAL	N/A
H	HDTV	4
I	INTERACTIVE	2
	COMBINED	100

Fig. 3c


SATELLITE MOVIE OPTIONS
VCTV COMBO
COMP. RATIO
AVAILABLE MENUS (1,2 & 3)
PRIORITY ONE MENUS
PRIORITY ONE PLUS TWO MENUS
1 8:1
2 8:1
3 8:1
4 8:1
5 8:1
6 8:1
7 8:1
8 8:1
9 4:1
10 4:1
11 8:1
12 8:1
13 8:1
14 8:1
15 8:1
16 8:1
17 8:1 or max
18 8:1 or max
HIT MOVIES 8 MOVIE SELECTIONS WITH START TIMES EVERY 15 MINUTES
SPORTS 8 SELECTIONS
CHILDRENS 8 SELECTIONS
DOCS/NEWS 8 SELECTIONS
ENTERTAIN-MENT 8 SELECTIONS
SPECIAL-INTEREST CHANNELS 16 SELECTIONS
PROMOS (1/6 SCREEN)48
DATA STREAM
MUSIC 32 DIGITED STATIONS
750 mHz (110)
108 mHz (18)
112 items/48 promos/32 + stations
236
HIT MOVIES 6 MOVIE SELECTIONS WITH START TIMES EVERY 30 MINUTES
SPORTS 2 SELECTIONS
CHILDRENS 2 SELECTIONS
DOCS/NEWS 2 SELECTIONS
ENTERTAIN-MENT 4 SELECTIONS
SPECIAL-INTEREST CHANNELS 4 SELECTIONS
PROMOS (1/6 SCREEN)6
DATA STREAM
MUSIC 4 DIGITED STATIONS
330 mHz (40)
48 mHz(g)
36 items/6 promos/0 + stations
230
HIT MOVIES 6 MOVIE SELECTIONS WITH START TIMES EVERY 15 MINUTES
SPORTS 4 SELECTIONS
CHILDRENS 4 SELECTIONS
DOCS/NEWS 4 SELECTIONS
ENTERTAIN-MENT 6 SELECTIONS
SPECIAL-INTEREST CHANNELS 8 SELECTIONS
PROMOS (1/6 SCREEN)48
DATA STREAM
MUSIC 32 DIGITED STATIONS
450 mHz (60)
76 mHz (13)
74 items/48 promos/32 + stations
233

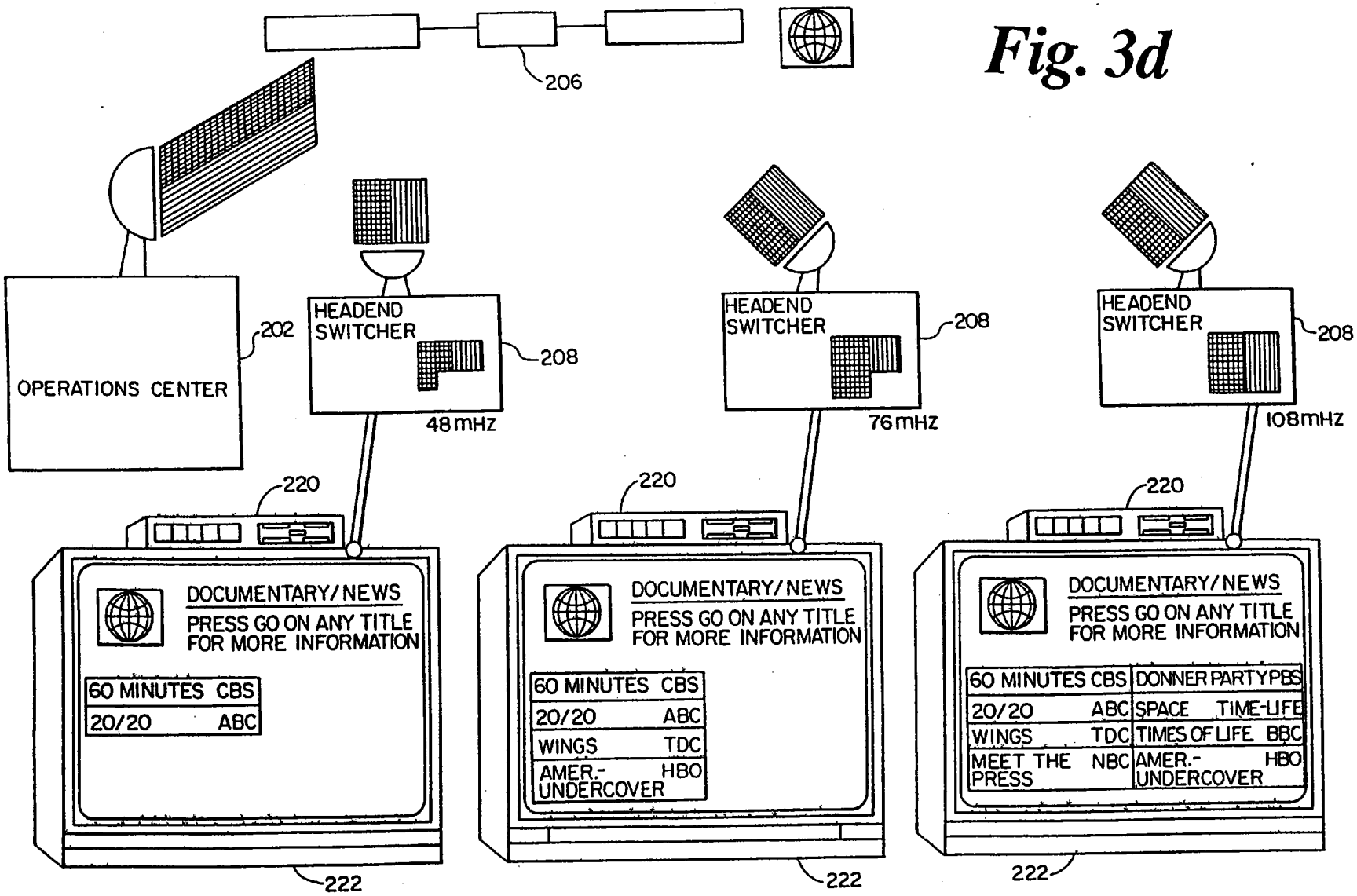
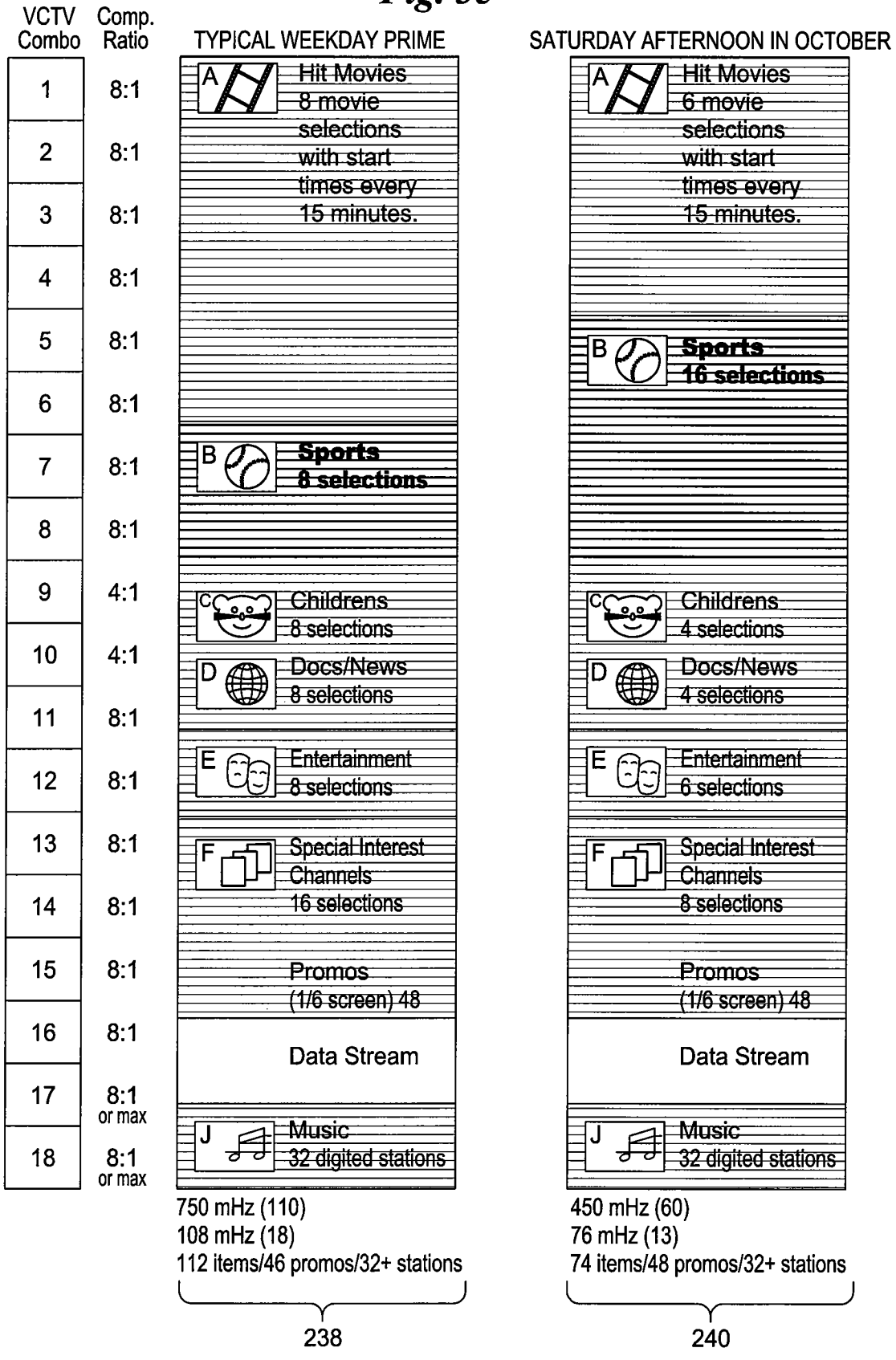

206
OPERATIONS CENTER
202
HEADEND SWITCHER
208
48 mHz
HEADEND SWITCHER
208
76 mHz
HEADEND SWITCHER
208
108 mHz
220
220
220
DOCUMENTARY/NEWS
PRESS GO ON ANY TITLE FOR MORE INFORMATION
60 MINUTES CBS
20/20 ABC
DOCUMENTARY/NEWS
PRESS GO ON ANY TITLE FOR MORE INFORMATION
60 MINUTES CBS
20/20 ABC
WINGS TDC
AMER.- UNDERCOVER HBO
DOCUMENTARY/NEWS
PRESS GO ON ANY TITLE FOR MORE INFORMATION
60 MINUTES CBS
DONNER PARTY PBS
20/20 ABC
SPACE TIME-LIFE
WINGS TDC
TIMES OF LIFE BBC
MEET THE PRESS NBC
AMER.- UNDERCOVER HBO
222
222
222

Fig. 3d

Fig. 3e


VCTV Combo
Comp. Ratio
TYPICAL WEEKDAY PRIME
SATURDAY AFTERNOON IN OCTOBER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
8:1
8:1
8:1
8:1
8:1
8:1
8:1
8:1
4:1
4:1
8:1
8:1
8:1
8:1
8:1
8:1
8:1 or max
8:1 or max
A Hit Movies 8 movie selections with start times every 15 minutes.
B Sports 8 selections
C Childrens 8 selections
D Docs/News 8 selections
E Entertainment 8 selections
F Special Interest Channels 16 selections
Promos (1/6 screen) 48
Data Stream
J Music 32 digited stations
A Hit Movies 6 movie selections with start times every 15 minutes.
B Sports 16 selections
C Childrens 4 selections
D Docs/News 4 selections
E Entertainment 6 selections
F Special Interest Channels 8 selections
Promos (1/6 screen) 48
Data Stream
J Music 32 digited stations
750 mHz (110)
108 mHz (18)
112 items/46 promos/32+ stations
450 mHz (60)
76 mHz (13)
74 items/48 promos/32+ stations
238
240

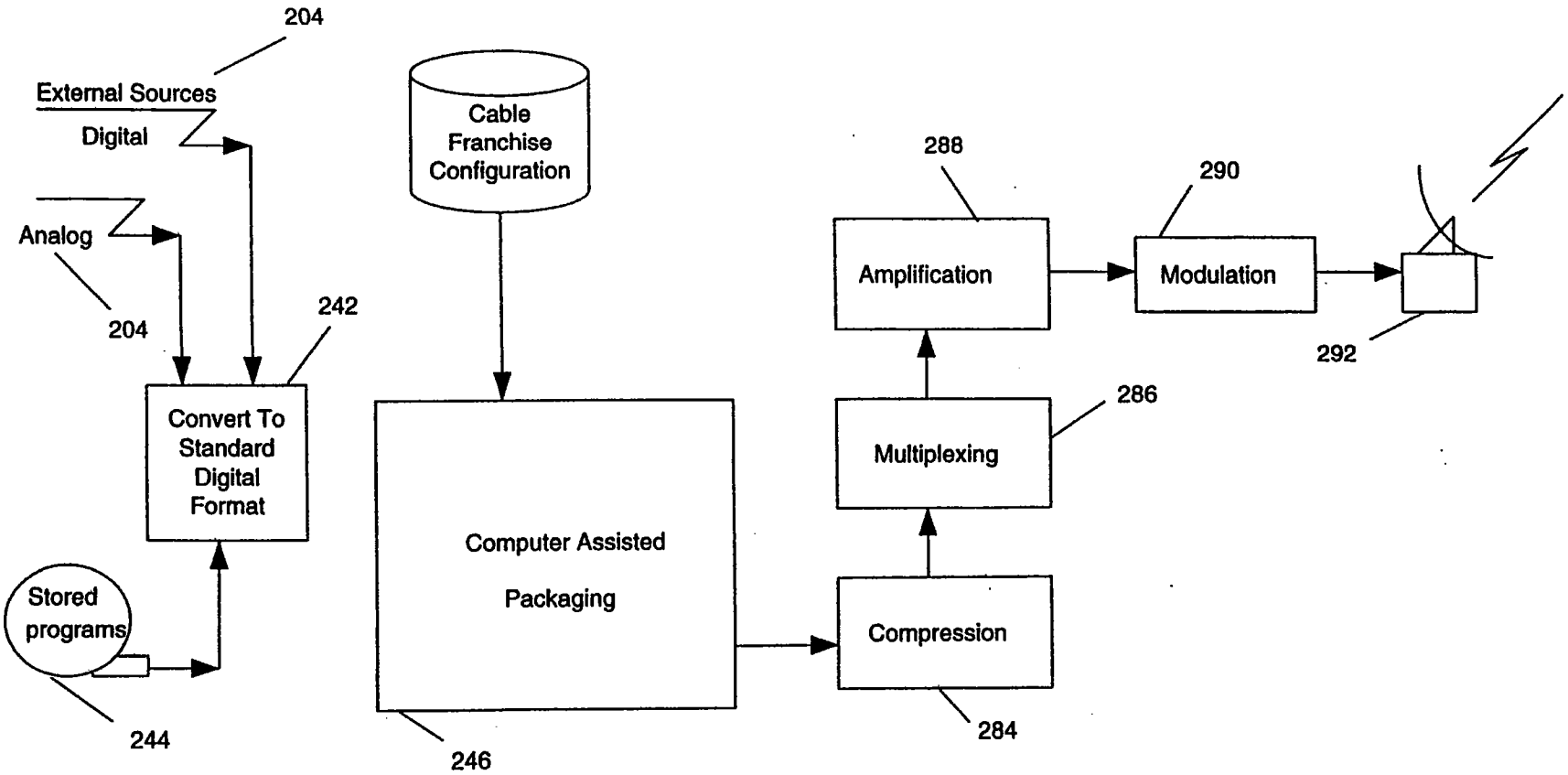

204
External Sources
Digital
Analog
204
242
Convert To Standard Digital Format
Stored programs
244
Cable Franchise Configuration
Computer Assisted Packaging
246
Compression
284
Multiplexing
286
Amplification
288
Modulation
290
292

Fig. 4a

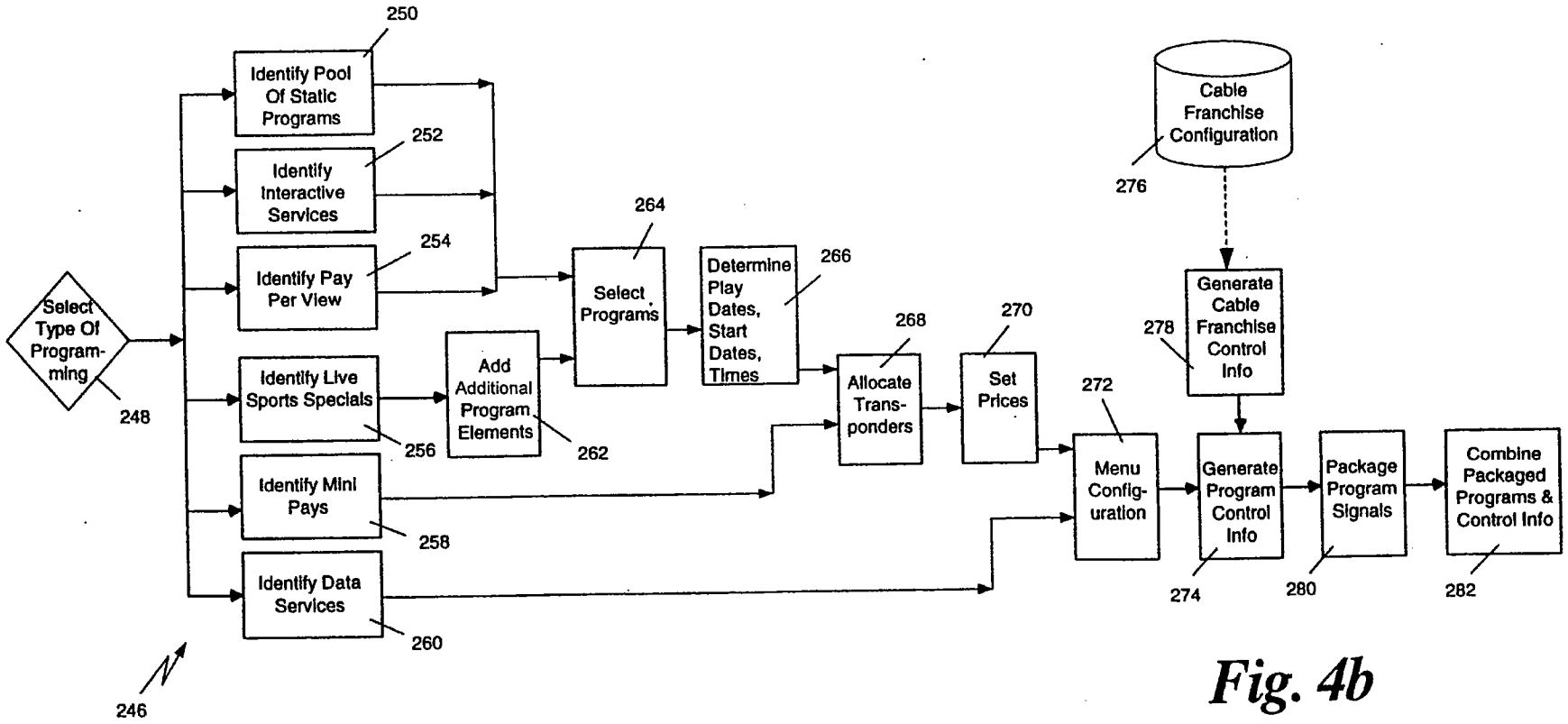

Select Type Of Programming
248
Identify Pool Of Static Programs
250
Identify Interactive Services
252
Identify Pay Per View
254
Identify Live Sports Specials
256
Identify Mini Pays
258
Identify Data Services
260
246
Add Additional Program Elements
262
Select Programs
264
Determine Play Dates, Start Dates, Times
266
Allocate Trans-ponders
268
Set Prices
270
Menu Config-uration
272
Cable Franchise Configuration
276
Generate Cable Franchise Control Info
278
Generate Program Control Info
274
Package Program Signals
280
Combine Packaged Programs & Control Info
282

Fig. 4b

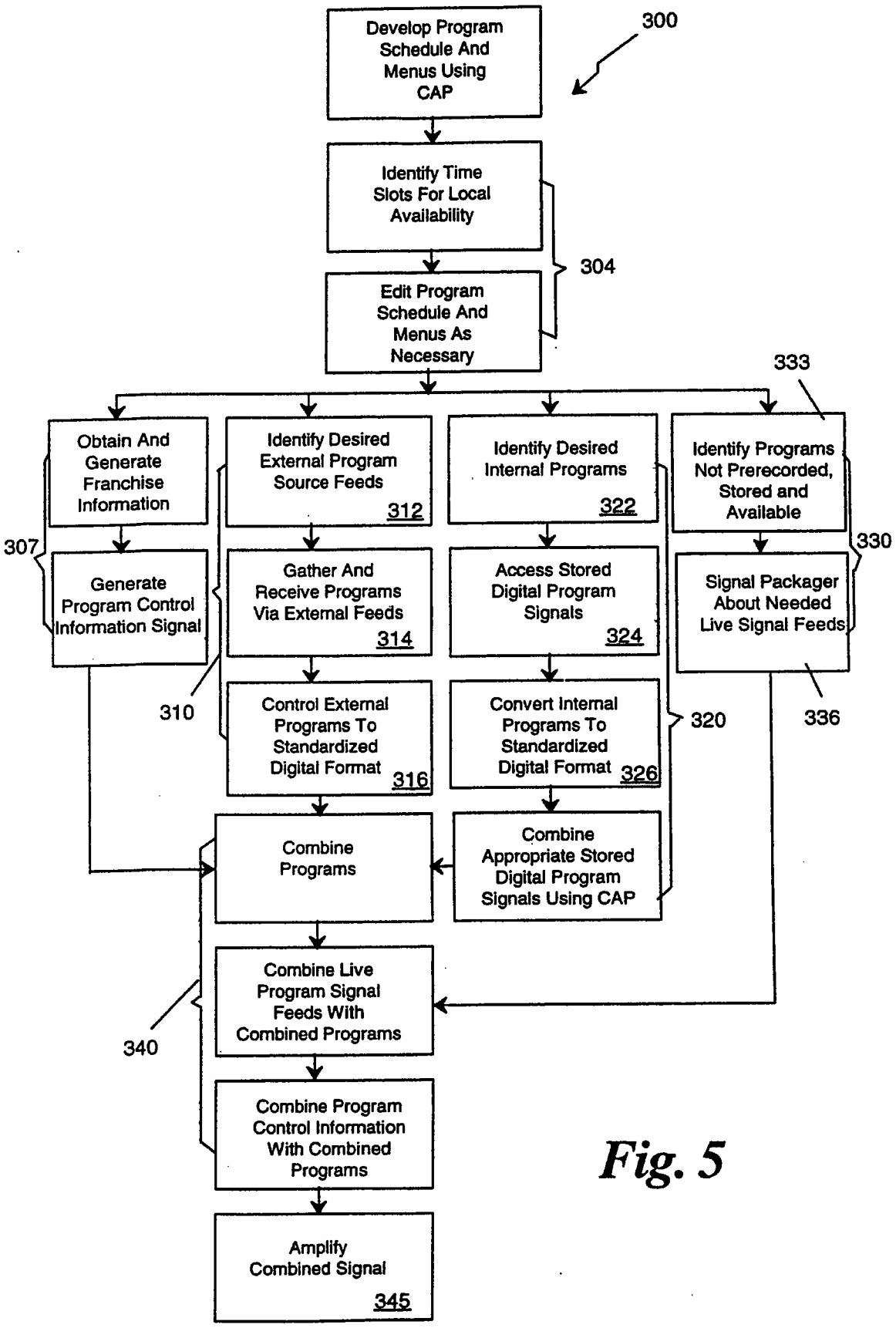

Develop Program Schedule And Menus Using CAP
300
Identify Time Slots For Local Availability
Edit Program Schedule And Menus As Necessary
304
333
Obtain And Generate Franchise Information
Identify Desired External Program Source Feeds
312
Identify Desired Internal Programs
322
Identify Programs Not Prerecorded, Stored and Available
307
Generate Program Control Information Signal
Gather And Receive Programs Via External Feeds
314
Access Stored Digital Program Signals
324
Signal Packager About Needed Live Signal Feeds
330
310
Control External Programs To Standardized Digital Format
316
Convert Internal Programs To Standardized Digital Format
326
320
336
Combine Programs
Combine Appropriate Stored Digital Program Signals Using CAP
Combine Live Program Signal Feeds With Combined Programs
340
Combine Program Control Information With Combined Programs
Amplify Combined Signal
345

Fig. 5

PROGRAM CONTROL INFORMATION
Chronologically by Channel

12:00 PM

*Program name	*Program length	*Menu code	*Description	*Video
1 Cheers	.5	E24	C	N
2 Terminator	2.0	A33	Tx	S
3 PrimeTime	1.0	D14	N	N
4 Football Special	.5	B24	S	N
•				
•				
•				
•				

12:30 PM

1 Simpsons	.5	E14 & C13	A	S
4 FootballGame	3.0	B13	S	N
•				
•				
•				

1:00 PM

1 Jaws	2.0	E16	Tx	S
3 Bugs Buny	1.0	C25	A	N
•				
•				
•				

1:30 PM

•				
•				
•				

Fig. 6

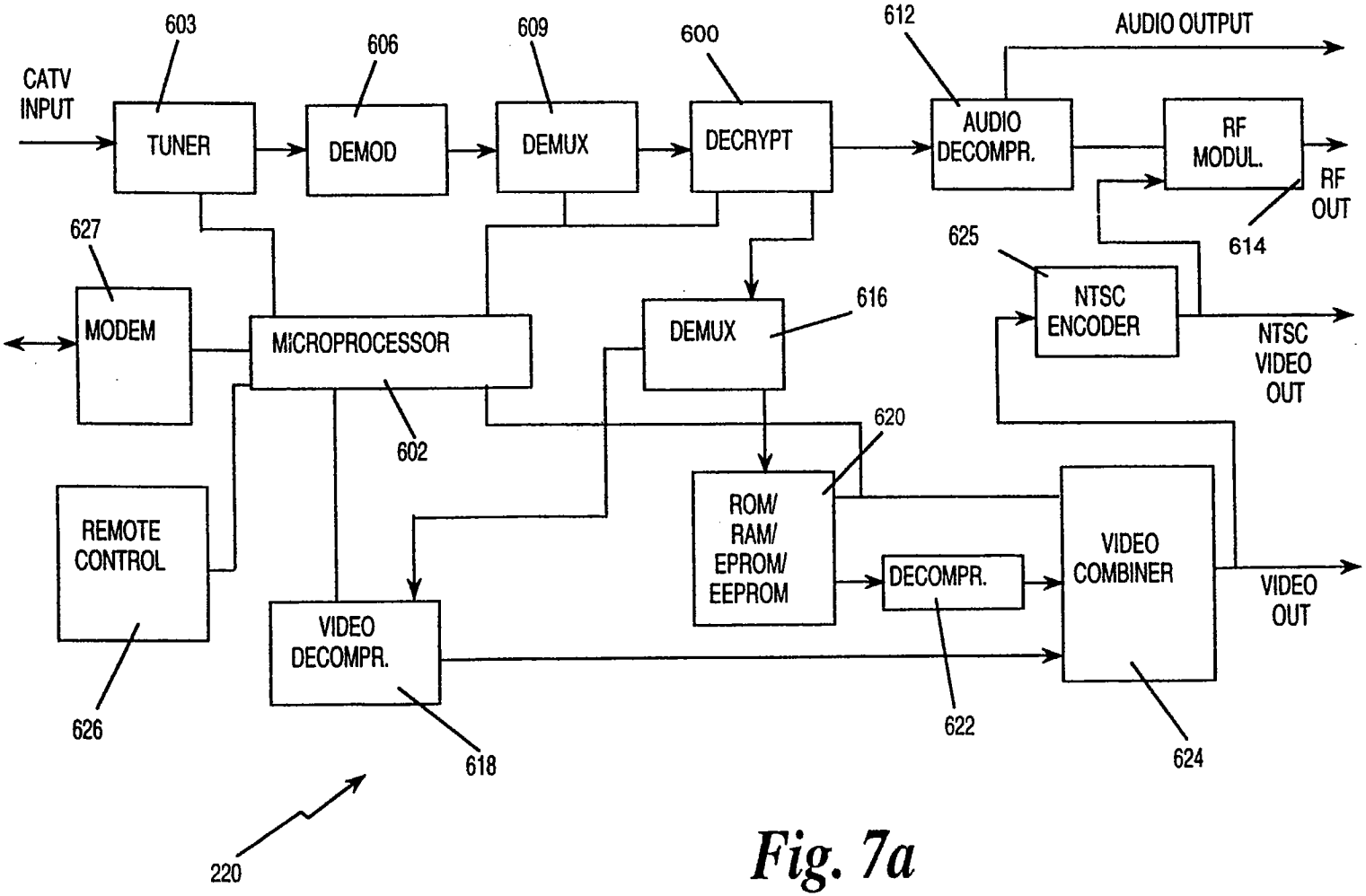

CATV INPUT
603
TUNER
606
DEMOD
609
DEMUX
600
DECRYPT
612
AUDIO DECOMPR.
AUDIO OUTPUT
RF MODUL.
RF OUT
614
627
MODEM
MICROPROCESSOR
602
DEMUX
616
625
NTSC ENCODER
NTSC VIDEO OUT
620
REMOTE CONTROL
626
ROM/ RAM/ EPROM/ EEPROM
DECOMPR.
622
VIDEO COMBINER
VIDEO OUT
624
VIDEO DECOMPR.
618
220

Fig. 7a

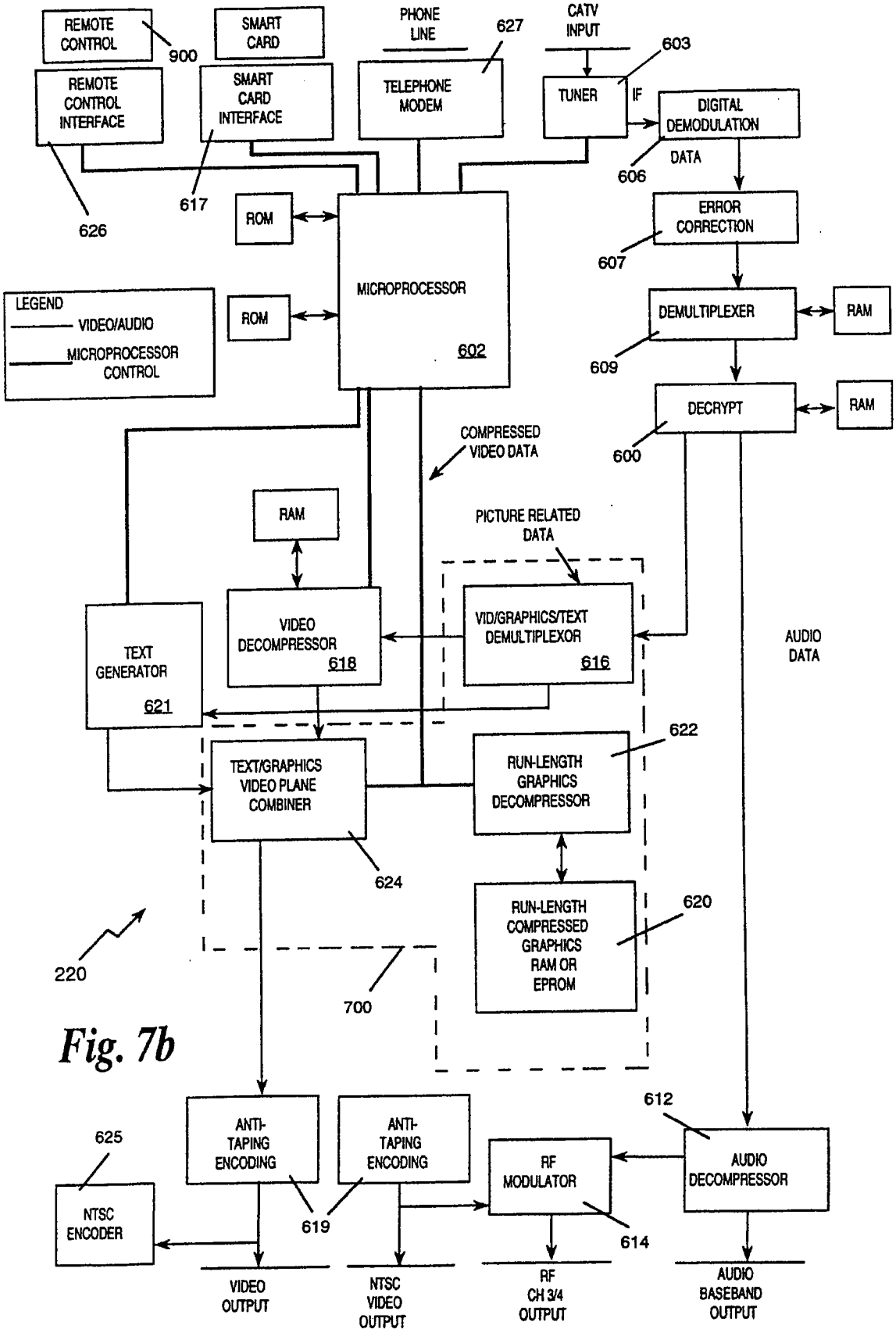

REMOTE CONTROL
900
SMART CARD
PHONE LINE
627
CATV INPUT
603
REMOTE CONTROL INTERFACE
SMART CARD INTERFACE
TELEPHONE MODEM
TUNER
IF
DIGITAL DEMODULATION
DATA
606
626
617
ROM
MICROPROCESSOR
602
ERROR CORRECTION
607
LEGEND
VIDEO/AUDIO
MICROPROCESSOR CONTROL
ROM
DEMULTIPLEXER
RAM
609
DECRYPT
RAM
600
COMPRESSED VIDEO DATA
RAM
PICTURE RELATED DATA
VIDEO DECOMPRESSOR
618
VID/GRAPHICS/TEXT DEMULTIPLEXOR
616
AUDIO DATA
TEXT GENERATOR
621
622
TEXT/GRAPHICS VIDEO PLANE COMBINER
RUN-LENGTH GRAPHICS DECOMPRESSOR
624
RUN-LENGTH COMPRESSED GRAPHICS RAM OR EPROM
620
220
700
612
625
ANTI-TAPING ENCODING
ANTI-TAPING ENCODING
RF MODULATOR
AUDIO DECOMPRESSOR
NTSC ENCODER
619
614
VIDEO OUTPUT
NTSC VIDEO OUTPUT
RF CH 3/4 OUTPUT
AUDIO BASEBAND OUTPUT

Fig. 7b

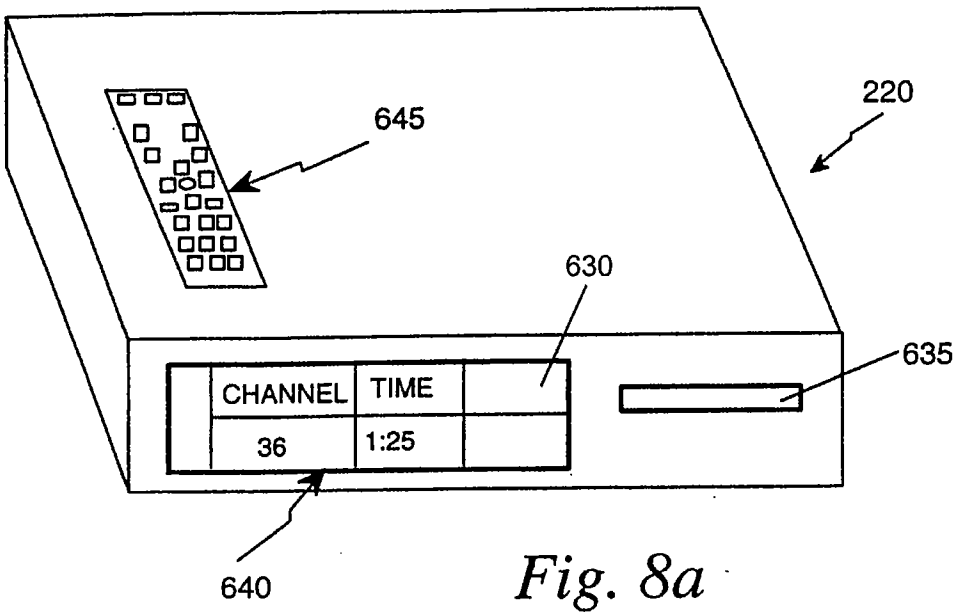

645
220
630
635
CHANNEL
TIME
36
1:25
640

Fig. 8a

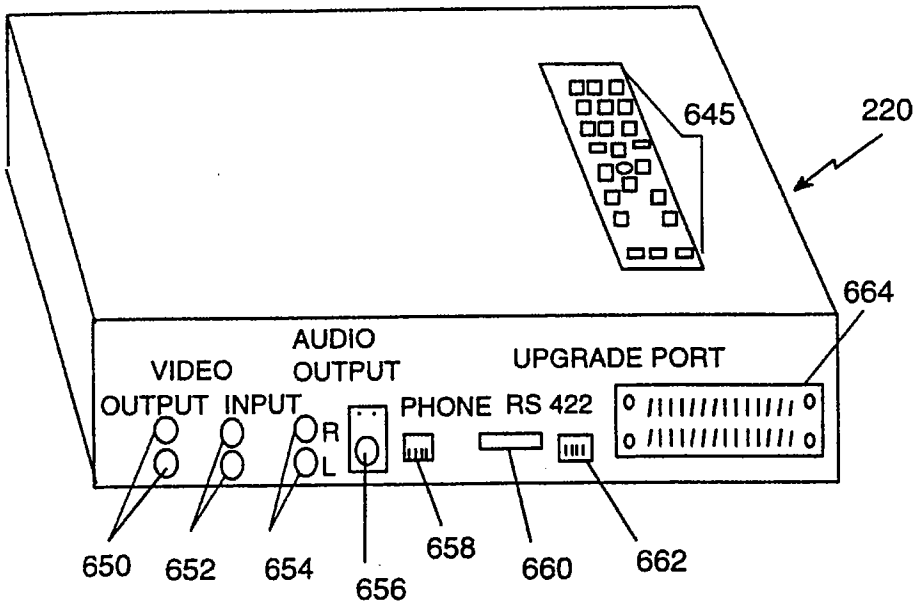

645
220
664
AUDIO
VIDEO
OUTPUT
UPGRADE PORT
OUTPUT
INPUT
R
L
PHONE
RS 422
650
652
654
656
658
660
662

Fig. 8b

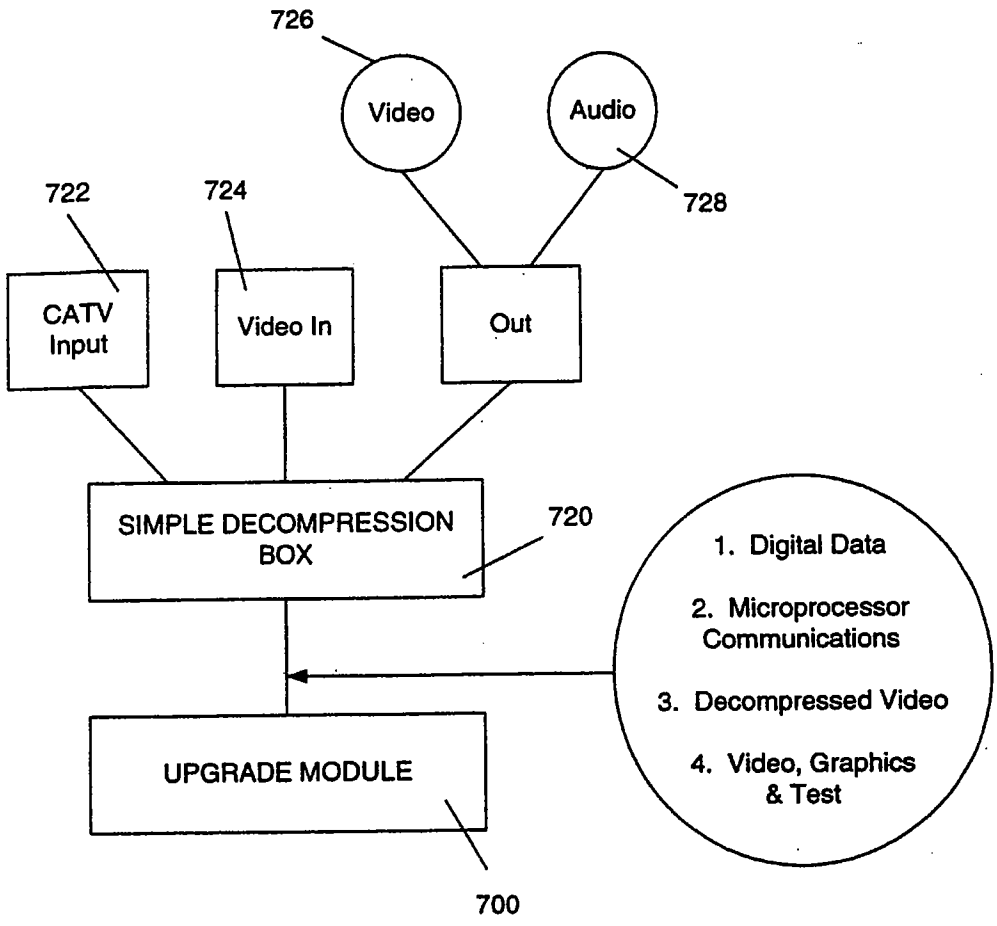

726
Video
Audio
728
722
724
CATV Input
Video In
Out
SIMPLE DECOMPRESSION BOX
720
1. Digital Data
2. Microprocessor Communications
3. Decompressed Video
4. Video, Graphics & Test
UPGRADE MODULE
700

Fig. 9a

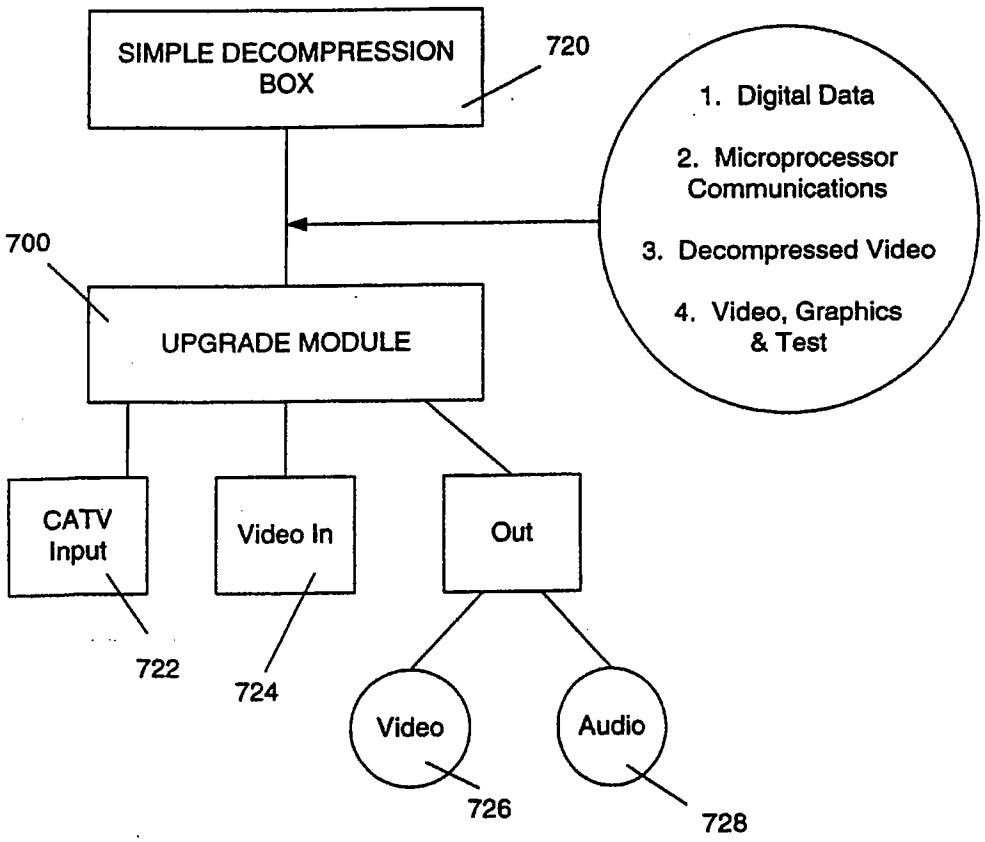

SIMPLE DECOMPRESSION BOX
720
1. Digital Data
2. Microprocessor Communications
3. Decompressed Video
4. Video, Graphics & Test
700
UPGRADE MODULE
CATV Input
Video In
Out
722
724
Video
Audio
726
728

Fig. 9b